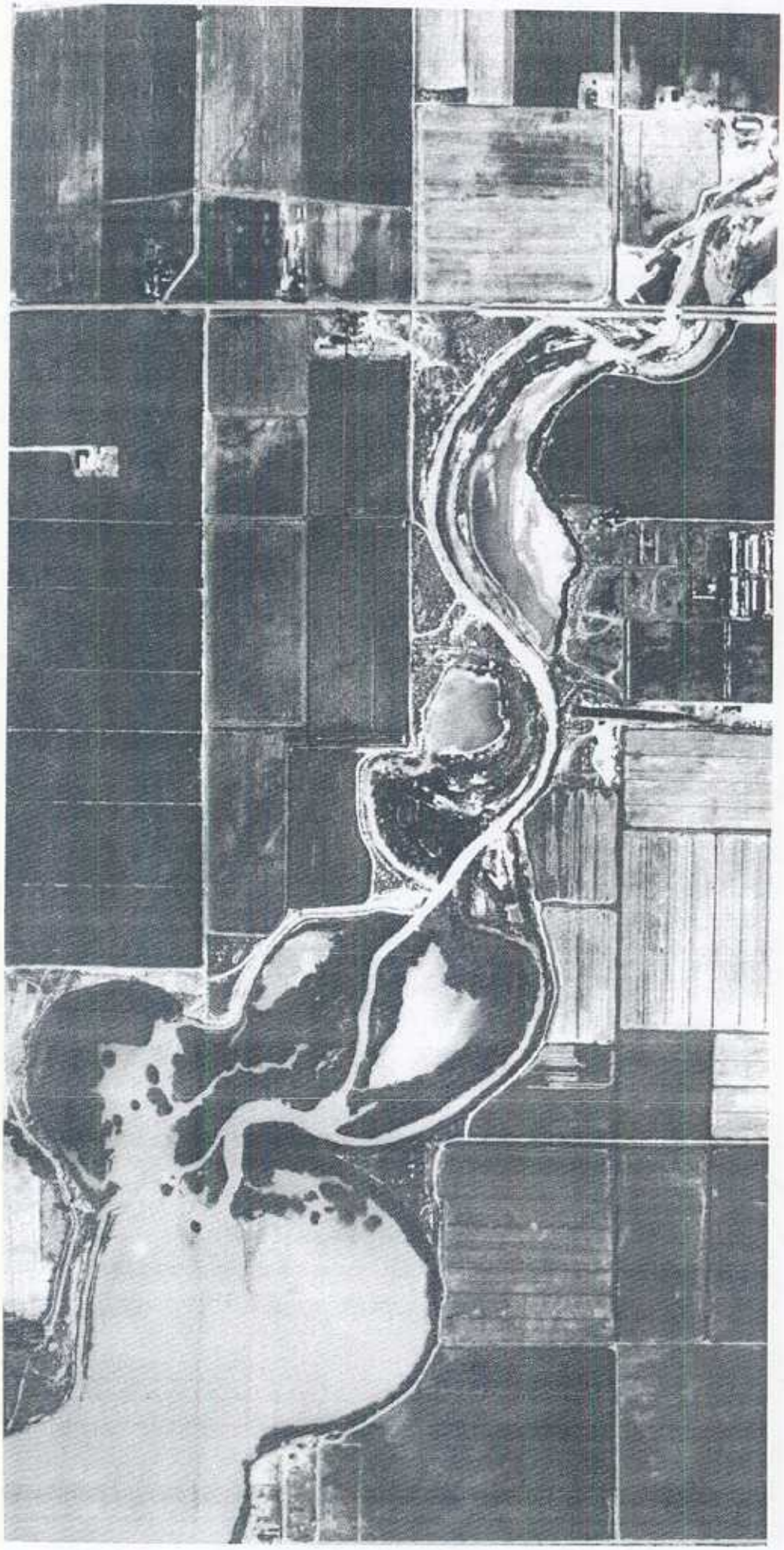


# Water-Related Land Use Inventories

# Utah

*Bear River Basin*

UTAH
NATURAL RESOURCES
Water Resources

# WATER-RELATED
# LAND USE INVENTORY REPORT
# of the
# BEAR RIVER BASIN
# (Utah Portion)

Aerial Photography and Field Mapping
Conducted in 1986

Prepared by

Utah Department of Natural Resources
Division of Water Resources

January 1991

## ACKNOWLEDGEMENTS

This land use inventory report was conducted under the direction of Paul L. Gillette, Deputy Director, and supervised by Lloyd H. Austin, Chief, Resource Inventories and Special Studies Section, Utah State Division of Water Resources. Staff members assisting were Jim Stephens, Eric Klotz, Steve Richardson, and Anne Lewis.

Jim Christensen, Utah Department of Agriculture, Bob Fotheringham, William Atkin and Frank Walker, Utah Division of Water Rights, and George Pyper, United States Geological Survey assisted in the field mapping/checking.

Appreciation is expressed to those who have provided time and effort to acquire data and information for this inventory.

D. Larry Anderson

D. Larry Anderson, Director

## TABLE OF CONTENTS

## LIST OF FIGURES

## LIST OF FIGURES (Continued)

## LIST OF TABLES

## SUMMARY

The Water-Related Land Use Inventory Report of the Utah portion of the Bear River Study Unit is the 14th report in a series of land use reports prepared by the Division of Water Resources over the past 20 years. A Study Unit and a Basin are used interchangeably in this report and refer to only the Utah portion of the Bear River Basin.

Since the late sixties, the division has continued a program of determining water supply and water use in each of the hydrologic areas throughout the state. Hydrologic and climatic data required to make these determinations are generally available from state and federal resources agencies, but up-to-date land use data has never been available from outside sources. The land use inventory program of the division was set up to supply the land use information needed in the preparation of hydrologic inventory reports and for other state water planning needs.

The water-related land use data for the Bear River Basin (Utah portion) is displayed in the report by subarea (see Figures 5 through 12) and tabulated by subarea and by county. The subarea and county tabular data is in Tables 2 and 3 respectively. Tables 2 and 3 are repeated in this summary as Tables i and ii.

As shown in Tables i and ii, nearly 569,030 acres of land in Box Elder, Cache, Rich, and Summit counties have been inventoried. This represents about 26 percent of the entire Utah portion of the Bear River Basin (approximately 2,163,000 acres). Areas not inventoried are mainly national forests and rangeland. Of the 569,030 inventoried acres, 277,670 are irrigated cropland, 24,103 are grasses and hays which receive subsurface

Table i. Summary of land cover (in acres) by subarea for the Utah portion of the Bear River Basin.

| Code | Cover | Subareas (Utah Portion) 2-1-10a | 2-1-10b & c | 2-2-8 | 2-2-5 | 2-3-3 | 2-3-2 | 2-3-1b | 2-3-1c | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| IA1a | Orchard | 2,151 | 320 | 183 | 97 | 0 | 0 | 0 | 0 | 2,750 |
| IA1e | Berries | 0 | 0 | 20 | 21 | 0 | 0 | 0 | 0 | 41 |
| IA2a | Grain | 4,147 | 31,081 | 34,348 | 549 | 224 | 1,243 | 0 | 0 | 71,591 |
| IA2a1 | Corn | 3,253 | 9,605 | 8,911 | 0 | 0 | 0 | 0 | 0 | 21,769 |
| IA2b1 | Potatoes | 52 | 960 | 3 | 0 | 0 | 0 | 0 | 0 | 1,015 |
| IA2b2 | Onions | 211 | 119 | 5 | 0 | 0 | 0 | 0 | 0 | 336 |
| IA2b3 | Beans | 58 | 627 | 205 | 0 | 0 | 0 | 0 | 0 | 889 |
| IA2b4 | Tomatoes | 19 | 17 | 9 | 0 | 0 | 0 | 0 | 0 | 46 |
| IA2c | Other Row Crops | 18 | 12 | 91 | 0 | 0 | 0 | 0 | 0 | 121 |
| IA3a | Alfalfa | 3,490 | 16,572 | 39,592 | 1,735 | 373 | 7,042 | 0 | 0 | 68,803 |
| IA3b | Grass Hay | 520 | 1,142 | 2,990 | 3,205 | 1,312 | 26,170 | 194 | 0 | 35,534 |
| IA3d | Pasture | 3,360 | 6,610 | 19,145 | 893 | 63 | 2,065 | 3,406 | 1,583 | 37,125 |
| IA3e | Turf | 0 | 461 | 24 | 0 | 0 | 0 | 0 | 0 | 484 |
| IA4a | Idle Plowed | 697 | 7,197 | 4,401 | 54 | 0 | 143 | 0 | 0 | 12,491 |
| IA4b | Idle Overgrown | 736 | 1,028 | 2,923 | 63 | 0 | 60 | 0 | 0 | 4,810 |
| IIA2a2 | Grass Hay (surf. & sub.) | 19 | 319 | 6 | 2,008 | 1,131 | 16,380 | 0 | 0 | 19,863 |
| Surface Irr. Cropland Subtotal | | 18,731 | 76,069 | 112,856 | 8,624 | 3,104 | 53,104 | 3,600 | 1,583 | 277,670 |
| IIA2b1 | Sub. Irr. Pasture | 4,133 | 6,935 | 6,958 | 213 | 533 | 2,310 | 0 | 0 | 21,082 |
| IIA2b2 | Sub. Irr. Grass Hay | 0 | 0 | 0 | 1,002 | 0 | 2,020 | 0 | 0 | 3,021 |
| Sub. Irr. Cropland Subtotal | | 4,133 | 6,935 | 6,958 | 1,215 | 533 | 4,330 | 0 | 0 | 24,103 |
| Total Irrigated Croplands | | 22,863 | 83,004 | 119,814 | 9,839 | 3,636 | 57,434 | 3,600 | 1,583 | 301,772 |
| IIC | Wet Flats | 1,296 | 2,801 | 29 | 0 | 0 | 633 | 10 | 0 | 4,768 |
| IIE | Riparian | 91 | 3,967 | 4,582 | 183 | 22 | 2,446 | 15 | 595 | 11,900 |
| IIF | Open Water | 12,465 | 3,361 | 9,248 | 35,475 | 105 | 1,081 | 316 | 851 | 62,903 |
| IIF4 | Other Water | 127,968 | 0 | 0 | 53 | 0 | 130 | 0 | 0 | 128,152 |
| IIF4a | Temp. Flooded | 6,703 | 10,478 | 5,941 | 0 | 0 | 0 | 0 | 0 | 23,122 |
| IIF4b | Sewage Lagoon | 0 | 0 | 61 | 0 | 0 | 0 | 0 | 0 | 61 |
| Wet/Open Water Areas Subtotal | | 148,522 | 20,607 | 19,861 | 35,711 | 127 | 4,291 | 341 | 1,447 | 230,905 |
| VB | Residential | 4,374 | 4,526 | 16,530 | 4,255 | 26 | 900 | 11 | 547 | 31,170 |
| VB4 | Public Open Space | 23 | 595 | 836 | 177 | 0 | 9 | 0 | 0 | 1,640 |
| VC | Commercial | 696 | 1,061 | 1,648 | 20 | 0 | 115 | 0 | 0 | 3,540 |
| Residential/Industrial Subtotal | | 5,093 | 6,182 | 19,014 | 4,452 | 26 | 1,024 | 11 | 547 | 36,350 |
| Land Use/Land Cover Totals | | 176,478 | 109,792 | 158,688 | 50,002 | 3,789 | 62,749 | 3,952 | 3,577 | 569,027 |

Table ii. Summary of land cover (in acres) by county for the Utah portion of the Bear River Basin.

| Code | Cover | Boxelder | Cache | Rich | Summit | Total |
|---|---|---|---|---|---|---|
| IA1a | Orchard | 2,470 | 183 | 97 | 0 | 2,750 |
| IA1e | Berries | 0 | 20 | 21 | 0 | 41 |
| IA2a | Grain | 35,227 | 34,348 | 2,016 | 0 | 71,591 |
| IA2a1 | Corn | 12,858 | 8,911 | 0 | 0 | 21,769 |
| IA2b1 | Potatoes | 1,013 | 3 | 0 | 0 | 1,015 |
| IA2b2 | Onions | 331 | 5 | 0 | 0 | 336 |
| IA2b3 | Beans | 684 | 205 | 0 | 0 | 889 |
| IA2b4 | Tomatoes | 37 | 9 | 0 | 0 | 46 |
| IA2c | Other Row Crops | 30 | 91 | 0 | 0 | 121 |
| IA3a | Alfalfa | 19,990 | 39,592 | 9,150 | 0 | 68,803 |
| IA3b | Grass Hay | 1,662 | 2,990 | 30,687 | 194 | 35,534 |
| IA3d | Pasture | 9,970 | 19,145 | 5,549 | 2,461 | 37,125 |
| IA3e | Turf | 461 | 24 | 0 | 0 | 484 |
| IA4a | Idle Plowed | 7,894 | 4,401 | 197 | 0 | 12,491 |
| IA4b | Idle Overgrown | 1,764 | 2,923 | 123 | 0 | 4,810 |
| IIA2a2 | Grass Hay (surf. & sub.) | 338 | 6 | 19,519 | 0 | 19,863 |
| Surface Irr. Cropland Subtotal | | 94,728 | 112,856 | 67,359 | 2,655 | 277,670 |
| IIA2b1 | Sub. Irr. Pasture | 11,068 | 6,958 | 3,056 | 0 | 21,082 |
| IIA2b2 | Sub. Irr. Grass Hay | 0 | 0 | 3,021 | 0 | 3,021 |
| Sub Irr. Cropland Subtotal | | 11,068 | 6,958 | 6,078 | 0 | 24,103 |
| Total Irrigated Croplands | | 105,796 | 119,814 | 73,437 | 2,655 | 301,772 |
| IIC | Wet Flats | 4,096 | 29 | 633 | 10 | 4,768 |
| IIE | Riparian | 4,058 | 4,582 | 2,665 | 595 | 11,900 |
| IIF | Open Water | 15,826 | 9,248 | 36,901 | 928 | 62,903 |
| IIF4 | Other Water | 127,968 | 0 | 183 | 0 | 128,152 |
| IIF4a | Temp. Flooded | 17,180 | 5,941 | 0 | 0 | 23,122 |
| IIF4b | Sewage Lagoon | 0 | 61 | 0 | 0 | 61 |
| Wet/Open Water Areas Subtotal | | 169,128 | 19,861 | 40,383 | 1,533 | 230,905 |
| VB | Residential | 8,900 | 16,530 | 5,184 | 555 | 31,170 |
| VB4 | Public Open Space | 618 | 836 | 186 | 0 | 1,640 |
| VC | Commercial | 1,757 | 1,648 | 135 | 0 | 3,540 |
| Residential/Industrial Subtotal | | 11,274 | 19,014 | 5,506 | 555 | 36,350 |
| Land Use/Land Cover Totals | | 286,199 | 158,688 | 119,325 | 4,743 | 569,027 |

irrigation, 230,905 are wet/open water areas, and 36,350 are residential/ industrial areas.

This report also discusses the Division of Water Resources previous and present methodology of collecting and processing water-related land use data. It discusses the various land use and classification codes used in past studies and the 1988 standard land use code which will be used by the division for future studies.

The information should be valuable to a variety of users, including county and city planners, state and federal agencies, and private land owners. The division will use the data to update hydrologic inventories, operate basin hydrologic models, and in studies to determine future water needs.

# INTRODUCTION

The Division of Water Resources has been charged by the Utah State Legislature with the responsibility of conducting state water planning which would coordinate and give direction to the activities of state and federal agencies concerned with Utah's water resources. To help fulfill this responsibility, the state was divided into 10 natural drainage basins or study units (shown in Figure 1). With the preparation of the Utah State Water Plan, January 1990, one more basin was added giving a total of 11. The South and East Colorado River Basin (originally designated basin No. 9) was divided into the Southeast Colorado River Basin (retaining designation No. 9) and the Lower Colorado River Basin, which is now basin No. 10.

While land use inventories contain information on land usage, hydrologic inventories contain climate, hydrologic, and general information on the water resources of the area. Hydrologic inventories also contain a water budget for each area of the state. The water budgets provide an accounting of water inflow, outflow, yield, storage, evaporation, transpiration and uses in the study area. Hydrologic inventories published by the division are listed in Appendix A. A major consideration in preparing water budgets is the quantity of water depleted through evaporation and transpiration. Estimates of these depletions are obtained from water-related land use inventories. A water-related land use inventory provides data on the kinds and extent of irrigated cropland, as well as similar information on wet/open water areas and on residential/industrial areas. Since 1966, the division has conducted these water-related land use inventories to prepare hydrologic inventories and conduct other state water planning activities. These inventories are of

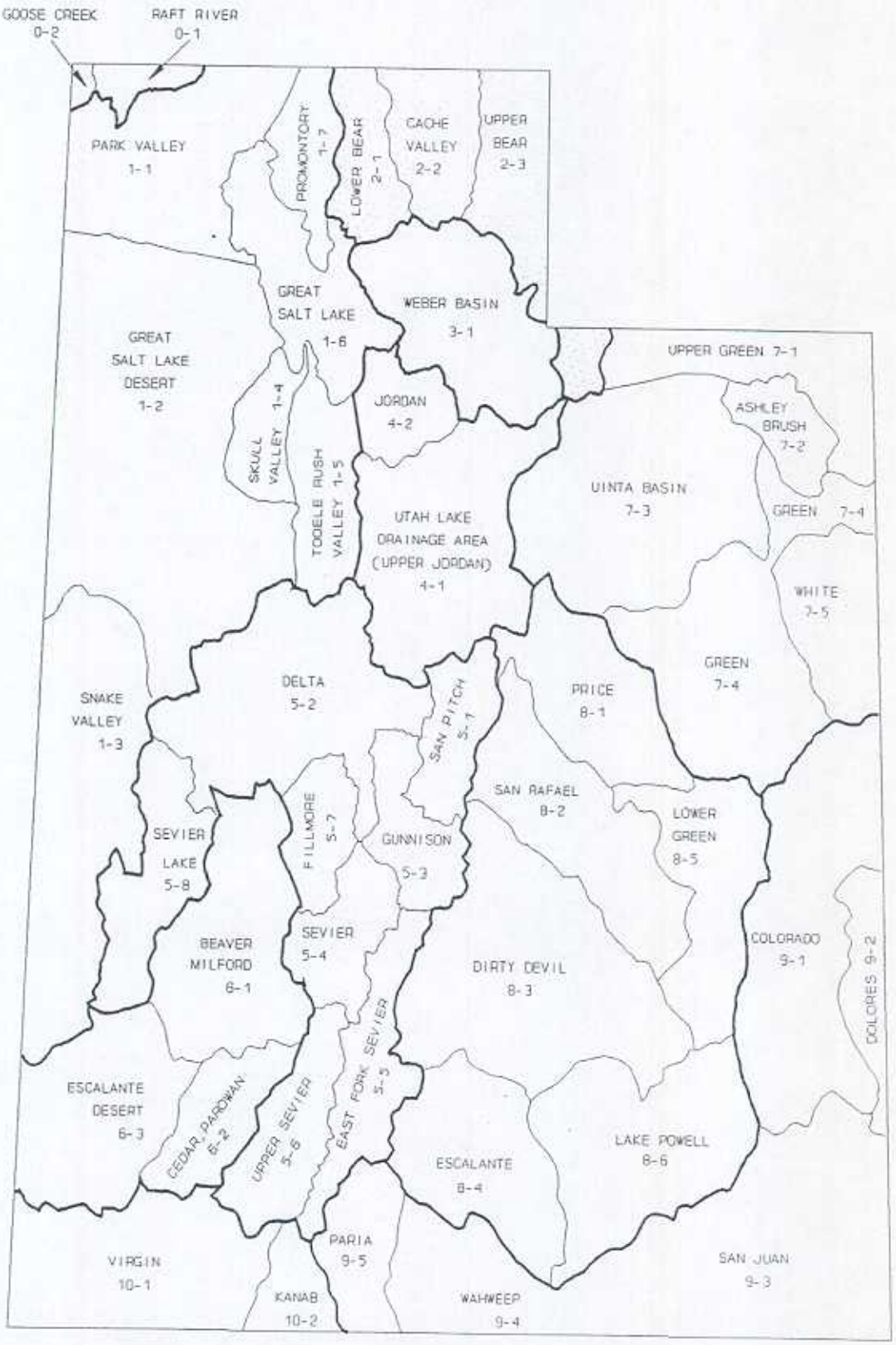



Figure 1. State of Utah hydrologic study areas with the Lower Bear, Cache Valley, and Upper Bear River areas highlighted.

particular importance as they relate to water use under the Upper Colorado River Compact of 1948 and the Amended Bear River Compact of 1980.

The division has a continual need for up-to-date water-related land use data to accurately determine changes in water use. To measure these changes, the division plans to update this data every 7 to 10 years.

This land use report should assist in promoting coordinated and orderly conservation, development, use, and management of water, soil, and related resources in the study area.

## BEAR RIVER STUDY UNIT WATER-RELATED LAND USE INVENTORY

The Bear River Study Unit Water-Related Land Use Inventory study area is shown in Figure 2. The west boundary is formed by the North Promontory Mountains. The Idaho state line forms the north boundary, and the east boundary is generally formed by the Wyoming state line. The south boundary is formed by Box Elder, Cache and Rich county lines. Figure 3 shows the Utah portion of the Bear River Basin divided into separate hydrologic study areas overlaid with a template showing USGS 7-1/2 minute quadrangle maps. The state Automated Geographic Reference Center (AGRC) reference numbers are cross-referenced with the division's reference number and the quadrangle name.

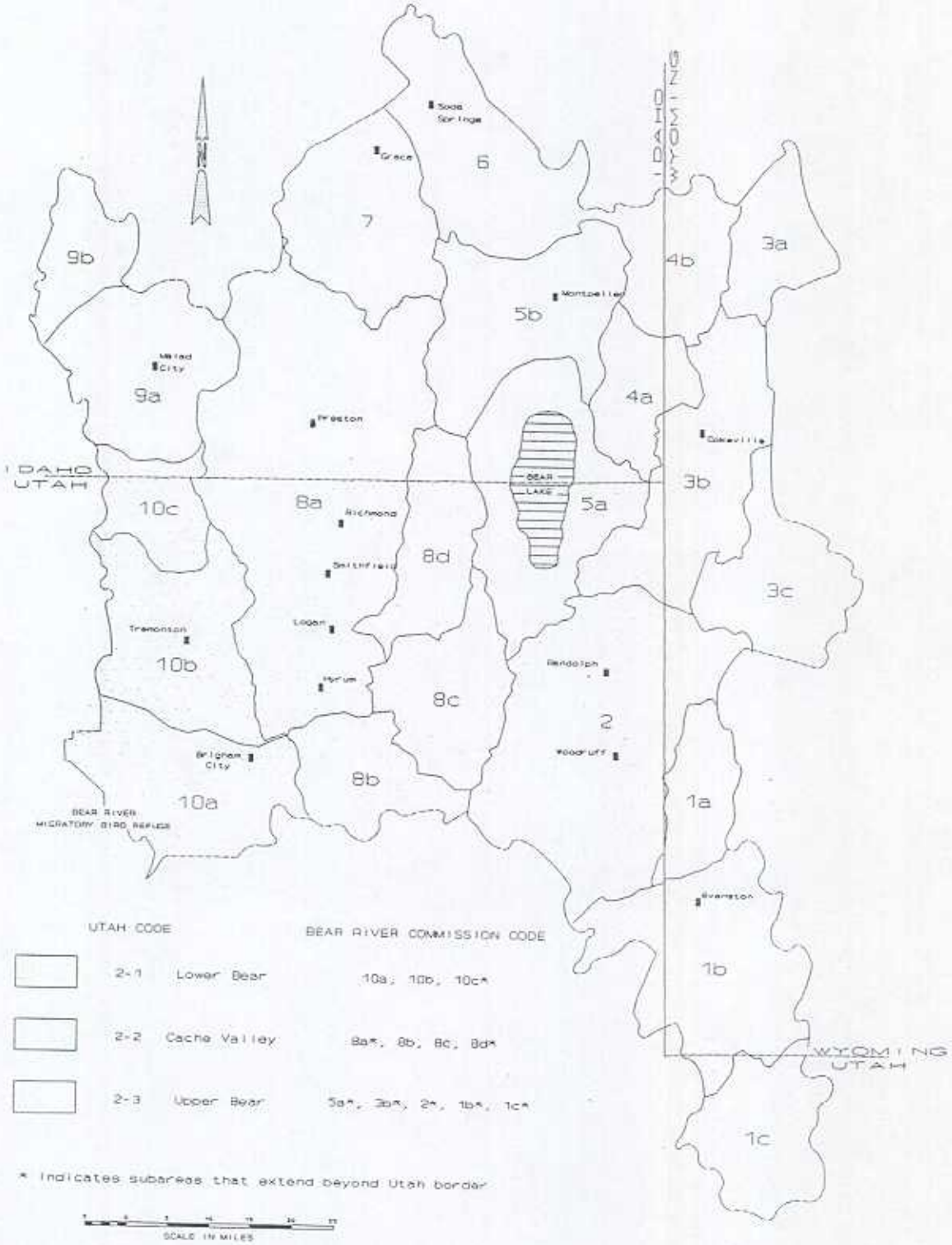



Figure 2. Hydrologic subareas of the Bear River drainage area.
Source: 1973 Bear River Study Unit Hydrologic Inventory.

List of 7-1/2 minute quadrangles in the Bear River Basin.

| List No. | Quadrangle Name | AGR No. | DWR No. | List No. | Quadrangle Name | AGR No. | DWR No. |
|---|---|---|---|---|---|---|---|
| 1. | Limekiln Knoll | 0316 | B06 | 41. | Curtis Ridge | 0623 | C29 |
| 2. | Portage | 0317 | B07 | 42. | Birch Creek Reservoirs | 0624 | C30 |
| 3. | Clarkston | 0318 | B08 | 43. | Woodruff | 0625 | C31 |
| 4. | Trenton | 0319 | C01 | 44. | Woodruff Narrows | 0626 | C32 |
| 5. | Richmond | 0320 | C02 | 45. | Mouth of Bear River | 0716 | B38 |
| 6. | Naomi Peak | 0321 | C03 | 46. | Whistler Canal | 0717 | B39 |
| 7. | Tony Grove Creek | 0322 | C04 | 47. | Willard | 0718 | B40 |
| 8. | Garden City | 0323 | C05 | 48. | Mantua | 0719 | C33 |
| 9. | Bear Lake South | 0324 | C06 | 49. | James Peak | 0720 | C34 |
| 10. | Sheeppen Creek | 0325 | C07 | 50. | Sharp Mtn. | 0721 | C35 |
| 11. | South Lake | 0326 | C08 | 51. | Monte Cristo Peak | 0722 | C36 |
| 12. | Blind Springs | 0416 | B14 | 52. | Dairy Ridge | 0723 | C37 |
| 13. | Riverside | 0417 | B15 | 53. | Meachum Ridge | 0724 | C38 |
| 14. | Cutler Dam | 0418 | B16 | 54. | Neponset Reservoir NW | 0725 | C39 |
| 15. | Newton | 0419 | C09 | 55. | Neponset Reservoir NE | 0726 | C40 |
| 16. | Smithfield | 0420 | C10 | 56. | Willard Spur | 0816 | C46 |
| 17. | Mt. Elmer | 0421 | C11 | 57. | Plain City SW | 0817 | B47 |
| 18. | Temple Peak | 0422 | C12 | 58. | Plain City | 0818 | B48 |
| 19. | Meadowville | 0423 | C13 | 59. | North Ogden | 0819 | C41 |
| 20. | Laketown | 0424 | C14 | 60. | Huntsville | 0820 | C42 |
| 21. | Sage Creek | 0425 | C15 | 61. | Horse Ridge | 0823 | C45 |
| 22. | Leefe | 0426 | C16 | 62. | Peck Canyon | 0824 | C46 |
| 23. | Thatcher Mtn. | 0516 | B22 | 63. | McKay Hollow | 0825 | C47 |
| 24. | Tremonton | 0517 | B23 | 64. | Murphy Ridge | 0826 | C48 |
| 25. | Honeyville | 0518 | B24 | 65. | Francis Canyon | 0924 | C54 |
| 26. | Wellsville | 0519 | C17 | 66. | Shearing Corral | 0925 | C55 |
| 27. | Logan | 0520 | C18 | 67. | Wahsatch | 0926 | C56 |
| 28. | Logan Peak | 0521 | C19 | 68. | Porcupine Ridge | 1026 | C64 |
| 29. | Boulder Mtn. | 0522 | C20 | 69. | Seven Tree Flat | 1127 | G01 |
| 30. | Red Spur Mtn. | 0523 | C21 | 70. | Deadman Mountain | 1128 | G02 |
| 31. | Old Canyon | 0524 | C22 | 71. | Elizabeth Mtn. | 1129 | G03 |
| 32. | Randolph | 0525 | C23 | 72. | Whitney Reservoir | 1227 | G09 |
| 33. | Rex Peak | 0526 | C24 | 73. | Christmas Meadows | 1228 | G10 |
| 34. | Public Shtg Grds | 0616 | B30 | 74. | Red Knob | 1229 | G11 |
| 35. | Bear River City | 0617 | B31 | 75. | Mirror Lake | 1327 | G17 |
| 36. | Brigham City | 0618 | B32 | 76. | Hayden Peak | 1328 | G18 |
| 37. | Mount Pisgah | 0619 | C25 | 77. | Explorer Peak | 1329 | G19 |
| 38. | Paradise | 0620 | C26 | | | | |
| 39. | Porcupine Reserv | 0621 | C27 | | | | |
| 40. | Hardware Ranch | 0622 | C28 | | | | |

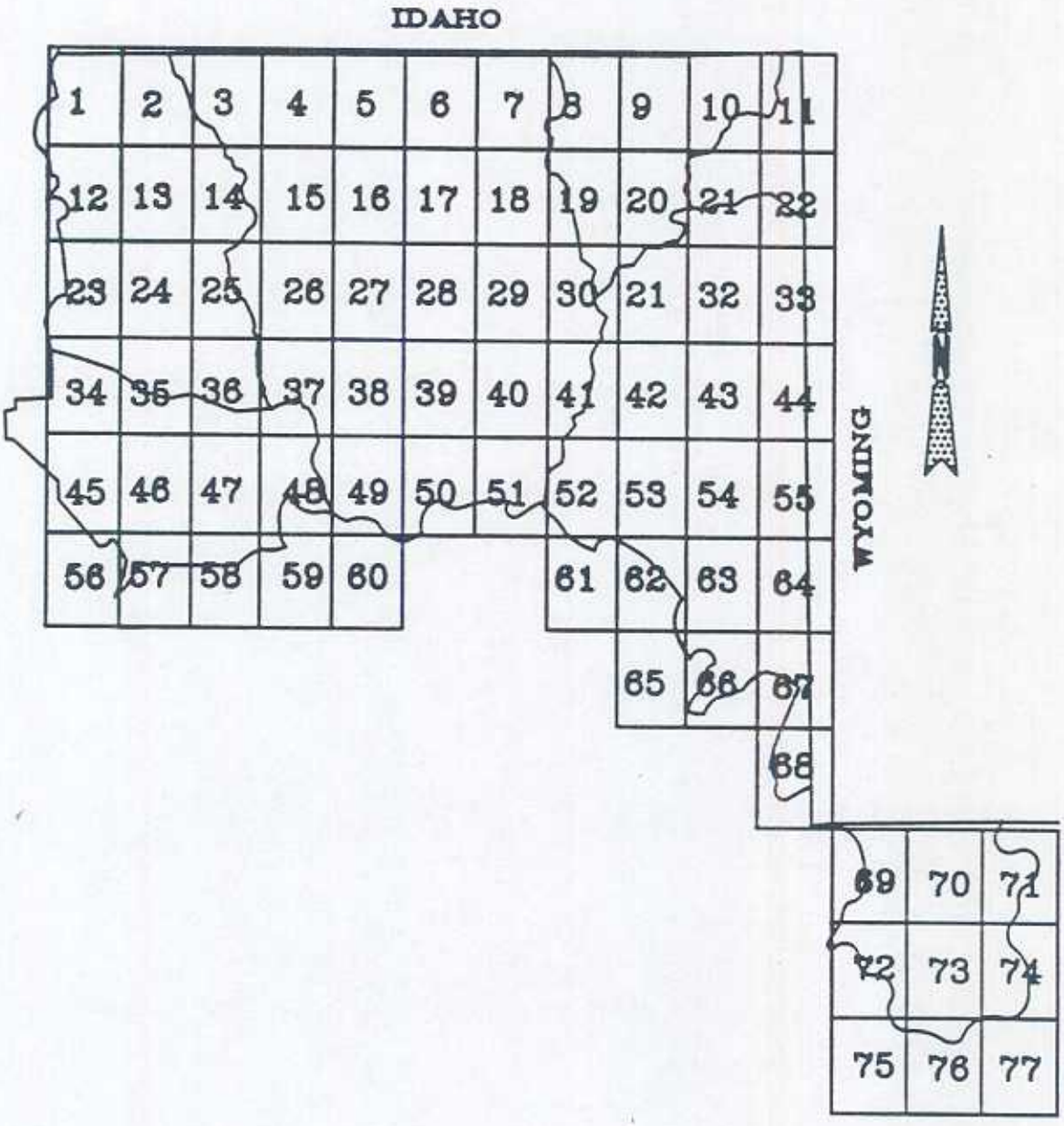



Figure 3. Bear River Basin (Utah portion) with hydrologic study area boundaries and overlaid by a template showing USGS 7-1/2 minute quadrangle maps.

## OPERATIONS USED IN LAND USE DATA ACQUISITION

### Aerial Photography

Aerial photography of the study area was obtained from June 15 to July 12, 1986. Intermountain Aerial Surveys Inc., Salt Lake City, Utah, photographed the study area using a turbo-charged Cessna TU-206 aircraft specially modified for aerial photography. An ARNAV R-40 Loran C navigational system kept the plane on line, while a Nikon F-3 35mm camera in the photo well took the photos. All slides were taken on 35mm Ektachrome film and processed by Kodak labs. Slides were identified according to flight line number, cross-referenced on a special location map, and delivered to the division at different times between June 25 and July 23, 1986. The actual flight date was written on each slide frame by the division. Approximately 1,400 slides were delivered to the division covering the water-related land use in the study area. These slides may be viewed at the offices of Water Resources Planning Section, 1636 West North Temple, Salt Lake City, Utah. Copies of the slides may also be purchased from the division.

### Field Maps

Transferring data from 35mm slides to the field maps commenced on June 26 and continued until mid-August 1986. Slide cataloging, filing and mapping were done concurrently.

### Field Checking

Field checking/mapping commenced on July 7 and continued until the first week of September 1986. This process involved five people from the Division of Water Resources, three from the Division of Water Rights, two from the Utah Department of Agriculture, and one from the U.S. Geological Survey.

## Digitizing and Processing

Field map digitizing and resulting data were processed through AGRC facilities during the fall and winter of 1986-87. The Bear River data is maintained at the AGRC and the Division of Water Resources. Maps and data can be obtained from the AGRC of the Department of Administrative Services, Division of Information and Technological Services, State Office Building, Salt Lake City, Utah.

A draft map of the cropland cover types was printed for each 7-1/2 minute quadrangle map for the purpose of checking the data. Each map was laid over the corresponding field map on a light table, and the cropland types and boundaries were double-checked for accuracy. Any corrections or additions were marked in red on the draft map for future updating. The corrected maps were updated and stored on the AGRC system.

## BEAR RIVER LAND USE DATA

Figure 4 shows the general location of the water-related land use areas mapped in the Utah portion of the Bear River Basin. The list of cover types and codes used in the 1986 Bear River water-related land use inventory is shown in Table 1. The 1986 cover types and codes are also used with Bear River land use data presented in this report. Figures 5-12 show the water-related land use for each hydrologic subarea. The explanations that accompany each of these figures shows land cover categories and acreage of land use for each category in greater detail.

Division policy is to publish land use data such as this report. Detailed maps, however, will not be included in the report. With the establishment of the AGRC for the state of Utah, the division policy is to supply the land use data to the AGRC Center for further distribution. Detailed maps can be obtained from AGRC.

Land cover area summary for the Bear River Basin, Figure 4.

| State Code | Land Cover | Acres |
|---|---|---|
| A | | 6.43 |
| I | Cropland | 11.79 |
| IA1a | Fruit | 2,750.37 |
| IA1e | Berries | 41.32 |
| IA2a | Grain | 71,437.07 |
| IA2a1 | Corn | 21,769.39 |
| IA2b1 | Potatoes | 1,015.29 |
| IA2b2 | Onions | 335.84 |
| IA2b3 | Beans | 889.40 |
| IA2b4 | Tomatoes | 45.96 |
| IA2c | Other Row Crops | 102.51 |
| IA3a | Alfalfa | 68,731.75 |
| IA3b | Grass Hay | 35,539.19 |
| IA3c | Grass/Turf | 484.40 |
| IA3d | Pasture | 37,125.40 |
| IA4a | Fallow | 12,469.31 |
| IA4b | Idle | 4,810.41 |
| IB1a | Grain/Beans/Seeds | 54,816.20[1] |
| IB2a | Alfalfa | 19,693.66[1] |
| IB2b | Pasture | 5,237.88[1] |
| IB3a | Fallow | 30,049.03[1] |
| IB3b | Idle | 3,180.62[1] |
| IIA2a1 | Pasture | 243.24 |
| IIA2a2 | Hayland | 19,620.57 |
| IIA2b1 | Pasture | 21,082.60 |
| IIA2b2 | Hayland | 3,021.12 |
| IIC | Wet Flats | 4,768.19 |
| IIE | Riparian | 11,900.19 |
| IF | Open Water | 62,903.18 |
| IIF4 | Other | 183.45[2] |
| IIF4a | Temporary Flooded | 23,122.29 |
| IIF4b | Sewage Lagoon | 60.46 |
| VB | Residential | 31,169.97 |
| VB3 | Open Spaces | 1,639.41 |
| VC | Commercial/Industrial | 3,540.04 |
| | | 553,797.93 |

[1]In conducting water-related land use inventories, the division attempts to inventory all lands or areas that consume or evaporate water other than natural precipitation. Non-irrigated agricultural lands are generally mapped if they fall within or border irrigated lands. Non-irrigated lands away from irrigated lands are normally not mapped. Acres shown in the table reflect only the number of acres mapped, not the total number of acres in the subarea.

[2]Excludes 127,698 acres of Great Salt Lake in Subarea 2-1-10a.

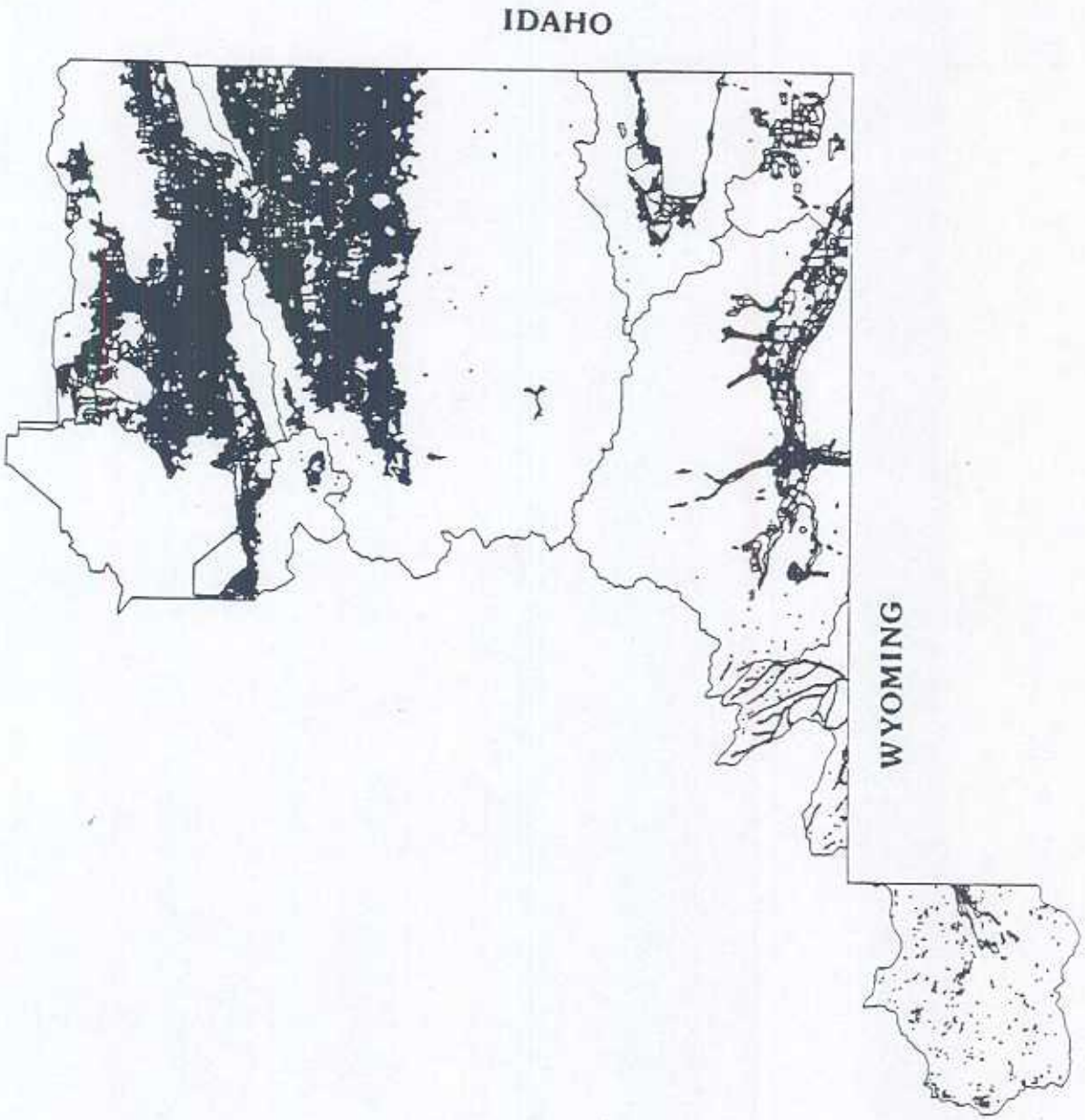



Figure 4. Water-related land use mapped areas for the Utah portion of the Bear River Basin.

Table 1. List of cover types and codes used in the 1986 Water-Related Land Use Inventory for the Bear River Basin.

| Code | Cover Type | Comments/Explanations |
|---|---|---|
| I | Cropland | (Rotation Crops) |
| IA | Irrigated Cropland | |
| IA1 | Horticulture & Specialty Crops | |
| IA1a | Fruit | (Orchards) |
| IA1a1 | Cherry | |
| IA1a2 | Apple | |
| IA1a3 | Peach | |
| IA1a4 | Pear | |
| IA1a5 | Apricot | |
| IA1a6 | Other | |
| IA1b | Nuts | (Groves) |
| IA1b1 | Walnut | |
| IA1b2 | Pecan | |
| IA1b3 | Other | |
| IA1c | Vineyard | (Grapes) |
| IA1d | Bush Fruit | |
| IA1e | Berries | |
| IA1f | Other Horticulture | (Nurseries) |
| IA1g | Other Specialty Crops | |
| IA2 | Row and Close Grown Crops | |
| IA2a | Grain | |
| IA2a1 | Corn | |
| IA2a2 | Sorghum | |
| IA2a3 | Wheat | |
| IA2a4 | Barley | |
| IA2a5 | Oats | |
| IA2a6 | Other Grains | |
| IA2b | Vegetables | |
| IA2b1 | Potatoes | |
| IA2b2 | Onions | |
| IA2b3 | Beans | |
| IA2b4 | Tomatoes | |
| IA2b5 | Sweet Corn | |
| IA2b6 | Other | (Melons, Squash, Etc.) |

Table 1. Continued.

| Code | Cover Type | Comments/Explanations |
|---|---|---|
| IA3 | Forage Crops | |
| IA3a | Alfalfa | |
| IA3b | Grass Hay | |
| IA3c | Grass/Turf | |
| IA3d | Pasture | (Turf Farms) |
| IA3e | Other | |
| IA4 | Other | |
| IA4a | Fallow | (Plowed or disked.) |
| IA4b | Idle | (Overgrown more than one season.) |
| IB | Non-Irrigated Cropland | (Rotation Crops) |
| IB1 | Row and Close-Grown Crops | |
| IB1a | Grain, Beans, Seeds | |
| IB1a1 | Wheat | |
| IB1a2 | Other Grains | (Barley, Etc.) |
| IB1a3 | Dry Beans | |
| IB1a4 | Safflower | |
| IB1a5 | Other | |
| IB2 | Hayland Crops | |
| IB2a | Alfalfa | |
| IB2b | Pasture | |
| IB2c | Other | |
| IB3 | Other | |
| IB3a | Fallow | (Plowed, Stubble, Mulch) |
| IB3b | Idle | (Overgrown more than one season.) |
| II | Grassy/Phreato./Open Water Areas | |
| IIA | Grassy Aspect | |
| IIA2a | Irrigated | |
| IIA2a1 | Pasture | (Subject to spring flooding.) |
| IIA2a2 | Hayland | (Subject to spring flooding.) |
| IIA2b | Non-Irrigated | |
| IIA2b1 | Pasture | (Receives subsurface water.) |
| IIA2b2 | Hayland | (Receives subsurface water.) |
| IIA2c | Non-Agricultural Use | (Receives subsurface water.) |
| IIB | Cattail/Bullrush Aspect | |

Table 1. Continued.

| Code | Cover Type | Comments/Recommendations |
|---|---|---|
| IIC | Wet Flats | (Mud flats w/little or no vgttn.) |
| IID | Shrub Aspect | (Salt Brush, Sagebrush) |
| IIE | Riparian | |
| IIE1 | Forested Aspect | (Cottonwoods, Birch) |
| IIE2 | Shrub Aspect | (Willows) |
| IIF | Open Water | |
| IIF1 | Streams | |
| IIF2 | Reservoirs | (Man-Made) |
| IIF3 | Ponds & Lakes | |
| IIF4 | Other | |
| IIF4a | Temporary Flooded | |
| IIF4b | Sewage Lagoon | |
| IIF4c | Evaporation Pond | |
| III | Rangeland and Forestland | |
| IIIA | Alpine Plant Communities | |
| IIIB | Conifer | |
| IIIB1 | Douglas Fir - White Fir | |
| IIIB2 | Ponderosa Pine | |
| IIIB3 | Fir - Spruce | |
| IIIB4 | Lodgepole Pine | |
| IIIB5 | Pinion Pine - Juniper | |
| IIIB6 | Other | |
| IIIC | Deciduous | |
| IIIC1 | Aspen | |
| IIIC2 | Mountain Brush | (Oak Brush, Maples, Chaparral) |
| IIIC3 | Other | |
| IIID | Grass Aspect | |
| IIID1 | Dry Pastures - Improved | (Chained and reseeded.) |
| IIID2 | Native Grasses | |
| IIID3 | Other | (Forbs) |
| IIIE | Shrub Aspect | |
| IIIE1 | Northern Desert Shrub | |
| IIIE1a | Sagebrush | (Shadscale, Greasewood, Halogeton) |

Table 1. Continued.

| Code | Cover Type | Comments/Explanations |
|---|---|---|
| IIIE1b | Other | |
| IIIE2 | Southern Desert Shrubs | |
| IIIE2a | Creosote Bush | |
| IIIE2b | Other | (Forbs, Annual Grasses) |
| IIIE3 | Salt Desert Shrubs | |
| IIIE3a | Shadscale | |
| IIIE3b | Greasewood | |
| IIIE3c | Saltbrush | |
| IIIE3d | Desert Molley | |
| IIIE3e | Other | (Halogeton) |
| IV | Barren Lands | |
| IVA | Bare Soil/Sand | |
| IVA1 | Dry Salt Flats | |
| IVA2 | Beaches | |
| IVA3 | Sandy Areas Other Than Beaches | (Desert Sand Dunes) |
| IVA4 | Other | |
| IVB | Rock Outcrops | |
| IVC | Excavated Lands | (Strip Mines, Quarries, Gravel Pits) |
| IVD | Other | |
| V | Built-Up Land | |
| VA | Farmsteads | |
| VA1 | Buildings/Homes | |
| VA2 | Open Spaces | (Feed Lots, Etc.) |
| VB | Residential | |
| VB1 | Buildings/Homes | (High Density) |
| VB2 | Buildings/Homes | (Low Density) |
| VB3 | Open Spaces | (Parks, Golf Courses) |
| VB4 | Idle Spaces | (Not Irrigated) |
| VC | Commercial/Industrial | |
| VC1 | Commercial | |
| VC2 | Industrial | |
| VC3 | Open Spaces | |
| VD | Transportation, Communications, Utilities | |
| VE | Other | |

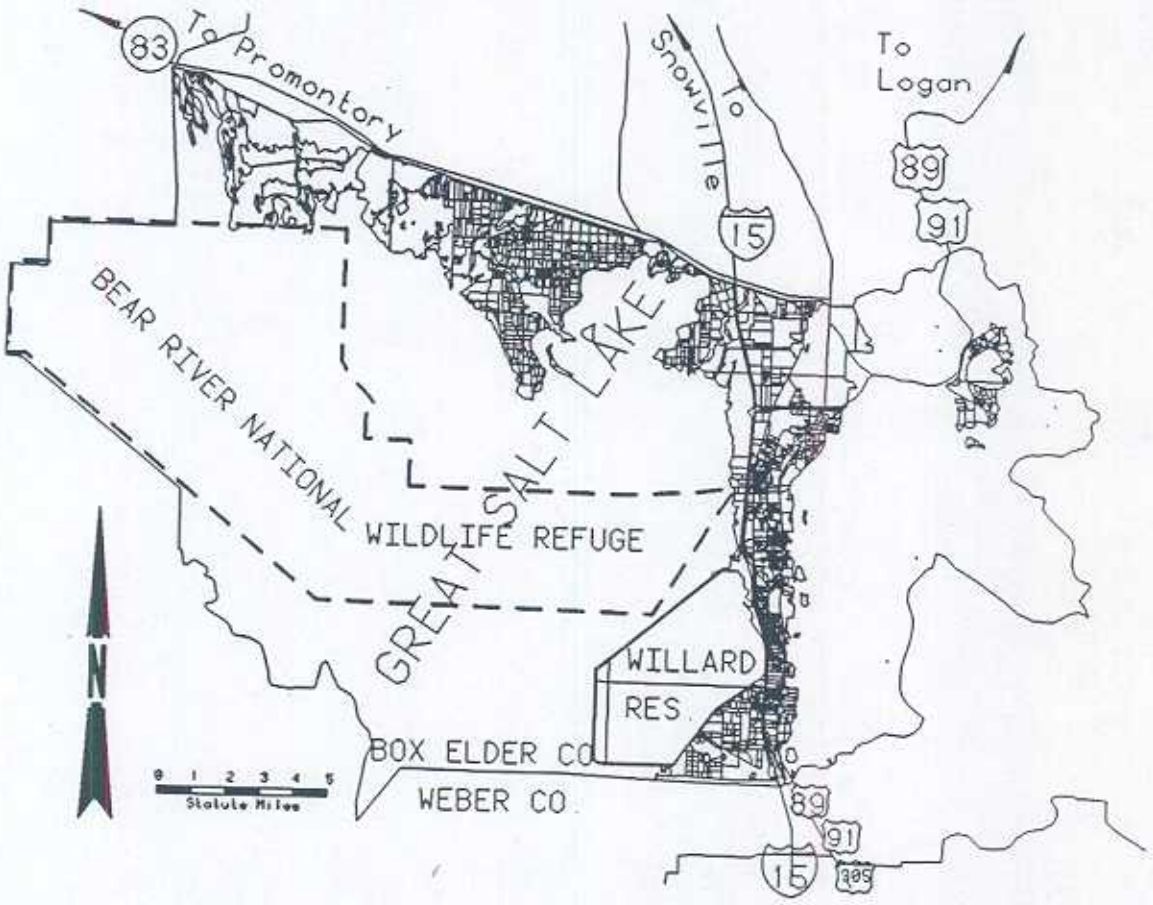



Figure 5. Water-related land use coverage of the Box Elder-Brigham sub-subarea (2-1-10a).

Land cover area summary for the Utah portion of the Box Elder-Tremonton/Malad sub-subareas (2-1-10b & 10c), Figure 6.

| Code | Land Cover | Acres |
|---|---|---|
| IA1a | Fruit Orchard | 169.8 |
| IA2a | Grain | 32,178.8 |
| IA2a1 | Corn | 9,592.6 |
| IA2b1 | Potatoes | 959.7 |
| IA2b2 | Onions | 119.0 |
| IA2b3 | Beans | 626.4 |
| IA2b4 | Tomatoes | 17.2 |
| IA2c | Other Row Crops | 11.9 |
| IA3a | Alfalfa | 16,958.9 |
| IA3b | Grass Hay | 1,366.3 |
| IA3d | Pasture | 6,690.6 |
| IA3e | Turf | 460.6 |
| IA4a | Idle-Plowed | 7,128.7 |
| IA4b | Idle-Overgrown | 1,027.9 |
| IB1a | Non-Irr. Grains | 20,427.3[1] |
| IB2a | Non-Irr. Alfalfa | 4,278.0[1] |
| IB2b | Non-Irr. Pasture | 3,001.0[1] |
| B3a | Non-Irr. Idle-Plowed | 12,399.0[1] |
| IB3b | Non-Irr. Idle-Ovrgrn | 795.9[1] |
| IIA2b1 | Wet Pasture/Non-Irr. | 7,144.9 |
| IIC | Wet Flats | 2,799.3 |
| IIE | Riparian Wetlands | 3,930.6 |
| IIF | Open Water | 3,408.3 |
| IIF4a | Temporarily Flooded | 10,473.5 |
| VB | Residential | 4,517.2 |
| VB4 | Public Open Space | 594.4 |
| VC | Commercial | 1,060.6 |
| | | 152,138.4 |

[1]In conducting water-related land use inventories, the division attempts to inventory all lands or areas that consume or evaporate water other than natural precipitation. Non-irrigated agriculture lands are generally mapped if they fall within or border irrigated lands. Non-irrigated lands away from irrigated lands are normally not mapped. Acres shown in the table reflect only the number of acres mapped, not the total number of acres in the subarea.

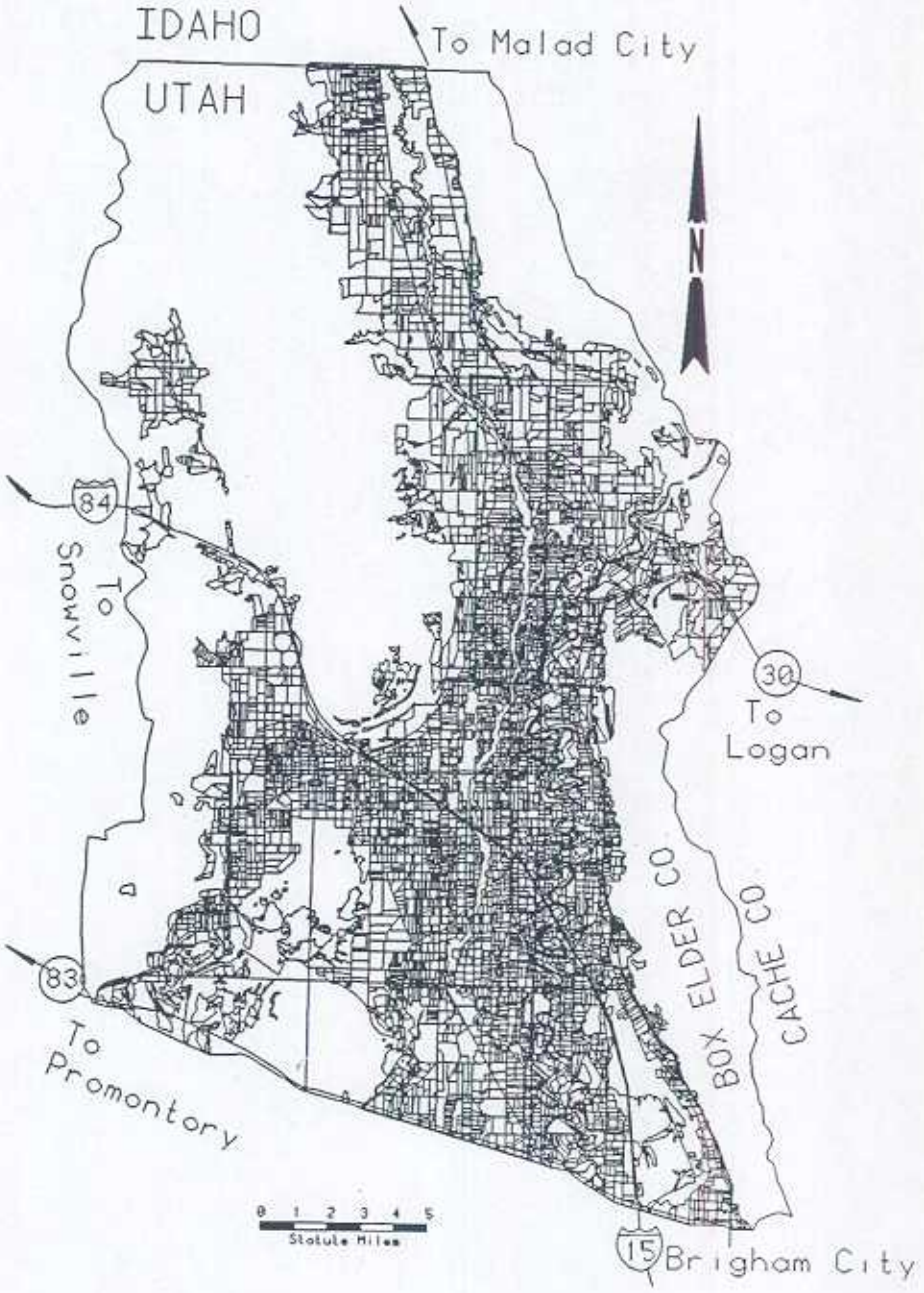



Figure 6. Water-related land use coverage of the Utah portion of the Box Elder Tremonton/Malad sub-subareas (2-1-10b & 10c).

Land cover area summary for the Utah portion of the Cache subarea (2-2-8), Figure 7.

| Code | Land Cover | Acres |
|---|---|---|
| IA1a | Fruit Orchard | 183.4 |
| IA1e | Berries | 20.0 |
| IA2a | Grain | 34,310.1 |
| IA2a1 | Corn | 8,901.0 |
| IA2b1 | Potatoes | 2.8 |
| IA2b2 | Onions | 5.3 |
| IA2b3 | Beans | 204.8 |
| IA2b4 | Tomatoes | 9.4 |
| IA2c | Other Row Crops | 90.5 |
| IA3a | Alfalfa | 39,567.4 |
| IA3b | Grass Hay | 2,989.2 |
| IA3d | Pasture | 19,084.5 |
| IA3e | Turf | 23.6 |
| IA4a | Idle-Plowed | 4,298.0 |
| IA4b | Idle-Overgrown | 2,900.4 |
| IB1a | Non-Irr. Grains | 25,209.6[1] |
| IB2a | Non-Irr. Alfalfa | 14,354.6[1] |
| IB2b | Non-Irr. Pastsure | 1,587.6[1] |
| IB3a | Non-Irr. Idle-Plowed | 12,611.0[1] |
| IB3b | Non-Irr. Idle-Ovrgrn | 1,467.1 |
| IIA2a2 | Irr. F.W. Hayland | 6.4 |
| IIA2b1 | Wet Pasture/Non-Irr. | 6,955.2 |
| IIC | Wet Flats | 28.9 |
| IIE | Riparian Wetlands | 4,579.5 |
| IIF | Open Water | 9,195.4 |
| IIF4a | Temporarily Flooded | 5,939.6 |
| IIF4b | Sewage Lagoon | 60.4 |
| VB | Residential | 16,576.9 |
| VB4 | Public Open Space | 835.3 |
| VC | Commercial | 1,589.1 |
| | | 213,587.0 |

[1]In conducting water-related land use inventories, the division attempts to inventory all lands or areas that consume or evaporate water other than natural precipitation. Non-irrigated agriculture lands are generally mapped if they fall within or border irrigated lands. Non-irrigated lands away from irrigated lands are normally not mapped. Acres shown in the table reflect only the number of acres mapped, not the total number of acres in the subarea.

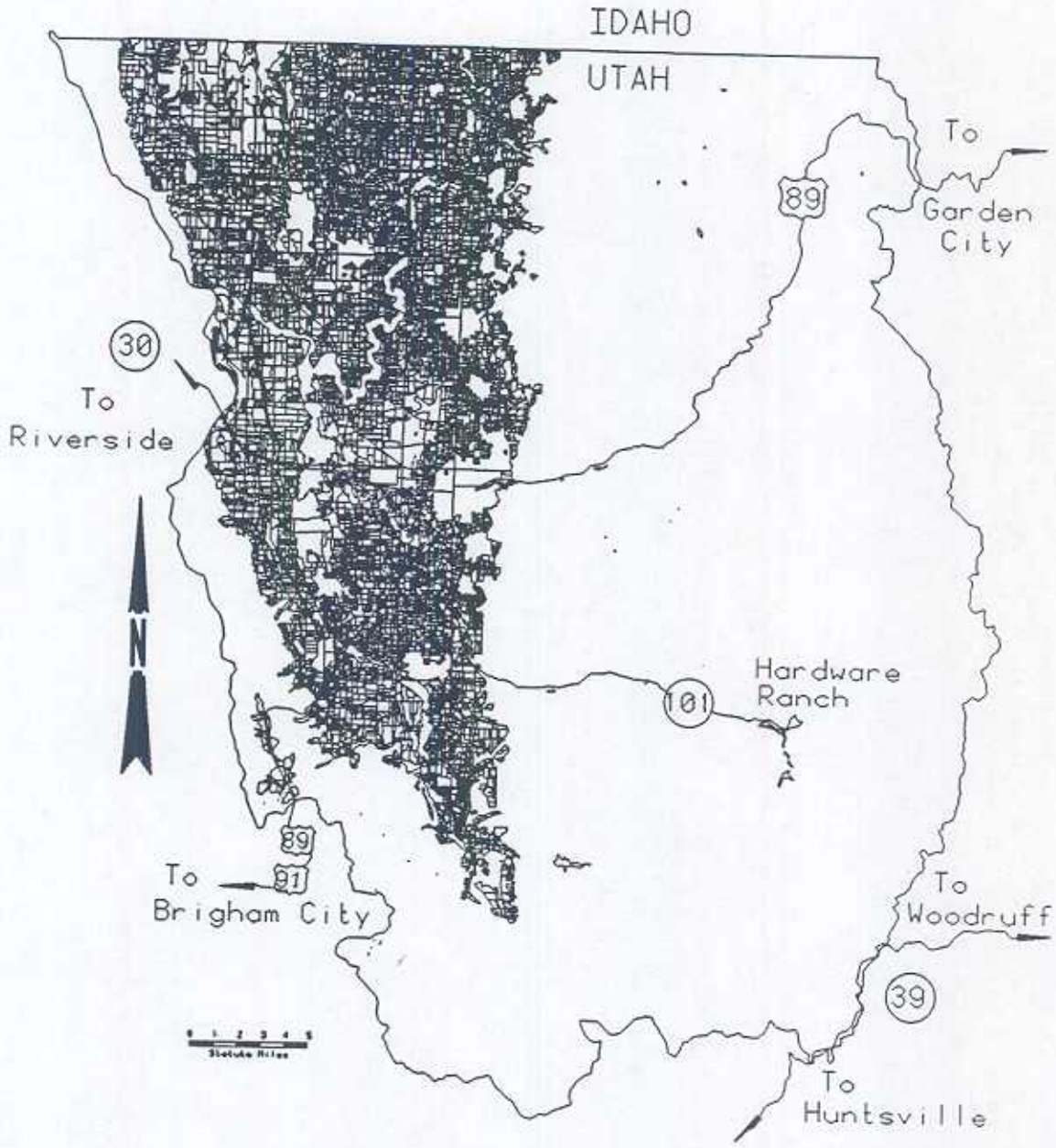



Figure 7. Water-related land use coverage of the Utah portion of the Cache subarea (2-2-8).

Land cover area summary for the Utah portion of the Bear Lake sub-subarea (2-3-5a), Figure 8.

| Code | Land Cover | Acres |
|---|---|---|
| IA1a | Fruit Orchard | 96.8 |
| IA1e | Berries | 21.4 |
| IA2a | Grain | 548.6 |
| IA3a | Alfalfa | 1,733.7 |
| IA3b | Grass Hay | 3,203.8 |
| IA3d | Pasture | 892.6 |
| IA4a | Idle-Plowed | 54.5 |
| IA4b | Idle-Overgrown | 62.7 |
| IB1a | Non-Irr. Grains | 4,556.7[1] |
| IB2a | Non-Irr. Alfalfa | 313.2[1] |
| IB2b | Non-Irr. Pasture | 144.3[1] |
| IB3a | Non-Irr. Idle-Plowed | 3,031.5[1] |
| IIA2a2 | Irr. F.W. Hayland | 2,007.0 |
| IIA2b1 | Wet Pasture/Non-Irr. | 213.2 |
| IIA2b2 | Non-Irr. F.W. Hay | 1,001.2 |
| IIE | Riparian Wetlands | 182.5 |
| IIF | Open Water | 35,460.8 |
| IIF4b | Sewage Lagoon | 53.3 |
| VB | Residential | 4,253.5 |
| VB4 | Public Open Space | 177.2 |
| VC | Commercial | 19.8 |
| | | 58,028.3 |

[1]In conducting water-related land use inventories, the division attempts to inventory all lands or areas that consume or evaporate water other than natural precipitation. Non-irrigated agriculture lands are generally mapped if they fall within or border irrigated lands. Non-irrigated lands away from irrigated lands are normally not mapped. Acres shown in the table reflect only the number of acres mapped, not the total number of acres in the subarea.

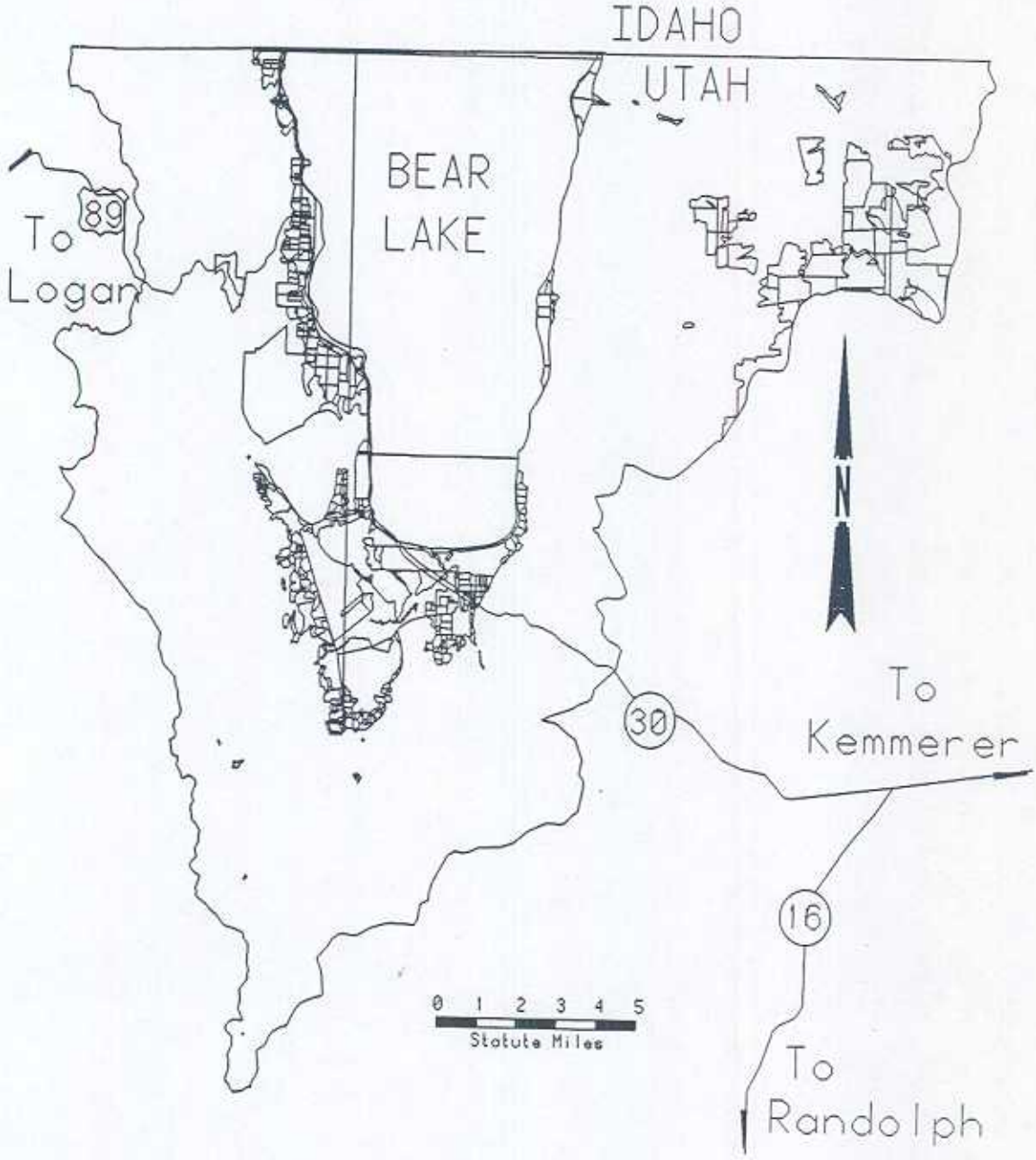



Figure 8. Water-related land use coverage of the Utah portion of the Bear Lake sub-subarea (2-3-5a).

Land cover area summary for the Utah portion of the Cokeville sub-subarea (2-3-3b), Figure 9.

| Code | Land Cover | Acres |
|---|---|---|
| IA2a | Grain | 224.2 |
| IA3a | Alfalfa | 373.0 |
| IA3b | Grass Hay | 1,316.7 |
| IA3d | Pasture | 63.7 |
| IB1a | Non-Irr. Grains | 3,126.7[1] |
| IB3a | Non-Irr. Idle-Plowed | 2,103.6[1] |
| IB3b | Non-Irr. Idle-Ovrgrn | 916.3[1] |
| IIA2a2 | Irr. F.W. Hayland | 1,131.0 |
| IIA2b1 | Wet Pasture/Non-Irr. | 533.5 |
| IIE | Riparian Wetlands | 21.6 |
| IIF | Open Water | 104.8 |
| VB | Residential | 26.4 |
| | | 9,941.5 |

[1]In conducting water-related land use inventories, the division attempts to inventory all lands or areas that consume or evaporate water other than natural precipitation. Non-irrigated agriculture lands are generally mapped if they fall within or border irrigated lands. Non-irrigated lands away from irrigated lands are normally not mapped. Acres shown in the table reflect only the number of acres mapped, not the total number of acres in the subarea.

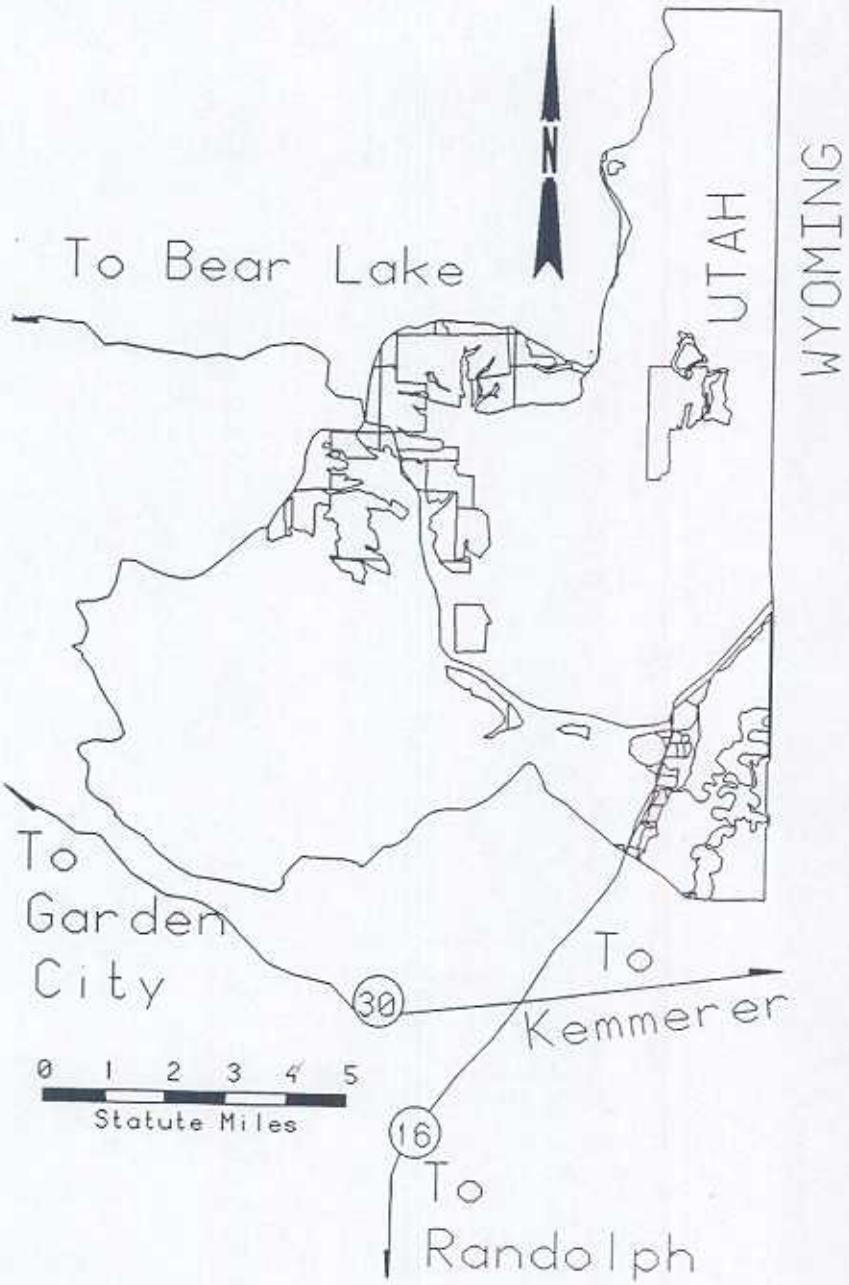



Figure 9. Water-related land use coverage of the Utah portion of the Cokeville sub-subarea (2-3-3b).

Land cover area summary for the Utah portion of the Randolph subarea (2-3-2), Figure 10.

| Code | Land Cover | Acres |
|---|---|---|
| IA2a | Grain | 1,242.6 |
| IA3a | Alfalfa | 7,039.5 |
| IA3b | Grass Hay | 26,157.7 |
| IA3d | Pasture | 2,064.4 |
| IA4a | Idle-Plowed | 142.7 |
| IA4b | Idle-Overgrown | 60.4 |
| IB2b | Non-Irr. Pasture | 101.4[1] |
| IIA2a2 | Irr. F.W. Hayland | 16,373.9 |
| IIA2b1 | Wet Pasture/Non-Irr. | 2,309.4 |
| IIA2b2 | Non-Irr. F.W. Hay | 2,018.7 |
| IIC | Wet Flats | 633.0 |
| IIE | Riparian Wetlands | 2,445.2 |
| IIF | Open Water | 1,081.0 |
| IIF4a | Temporarily Flooded | 130.1 |
| VB | Residential | 899.4 |
| VB4 | Public Open Space | 9.0 |
| VC | Commercial | 117.8 |
| | | 62,826.2 |

[1]In conducting water-related land use inventories, the division attempts to inventory all lands or areas that consume or evaporate water other than natural precipitation. Non-irrigated agriculture lands are generally mapped if they fall within or border irrigated lands. Non-irrigated lands away from irrigated lands are normally not mapped. Acres shown in the table reflect only the number of acres mapped, not the total number of acres in the subarea.

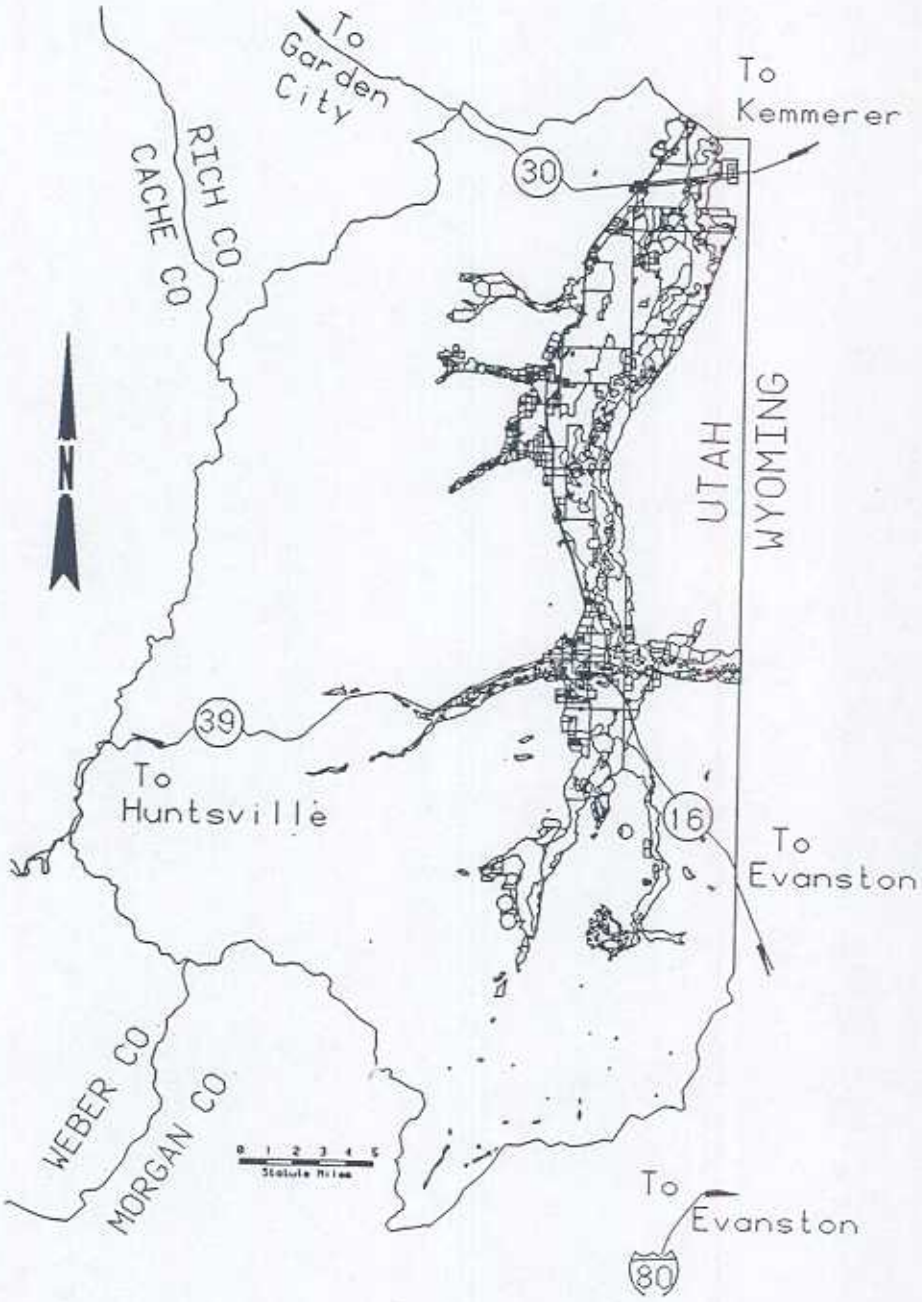



Figure 10. Water-related land use coverage of the Utah portion of the Randolph subarea (2-3-2).

Land cover area summary for the Utah portion of the Evanston-Uinta sub-subarea (2-3-1c), Figure 12.

| Code | Land Cover | Acres |
|---|---|---|
| IA3d | Pasture | 1,582.3 |
| IIE | Riparian Wetlands | 595.4 |
| IIF | Open Water | 850.9 |
| VB | Residential | 547.1 |
| | | 3,575.7 |

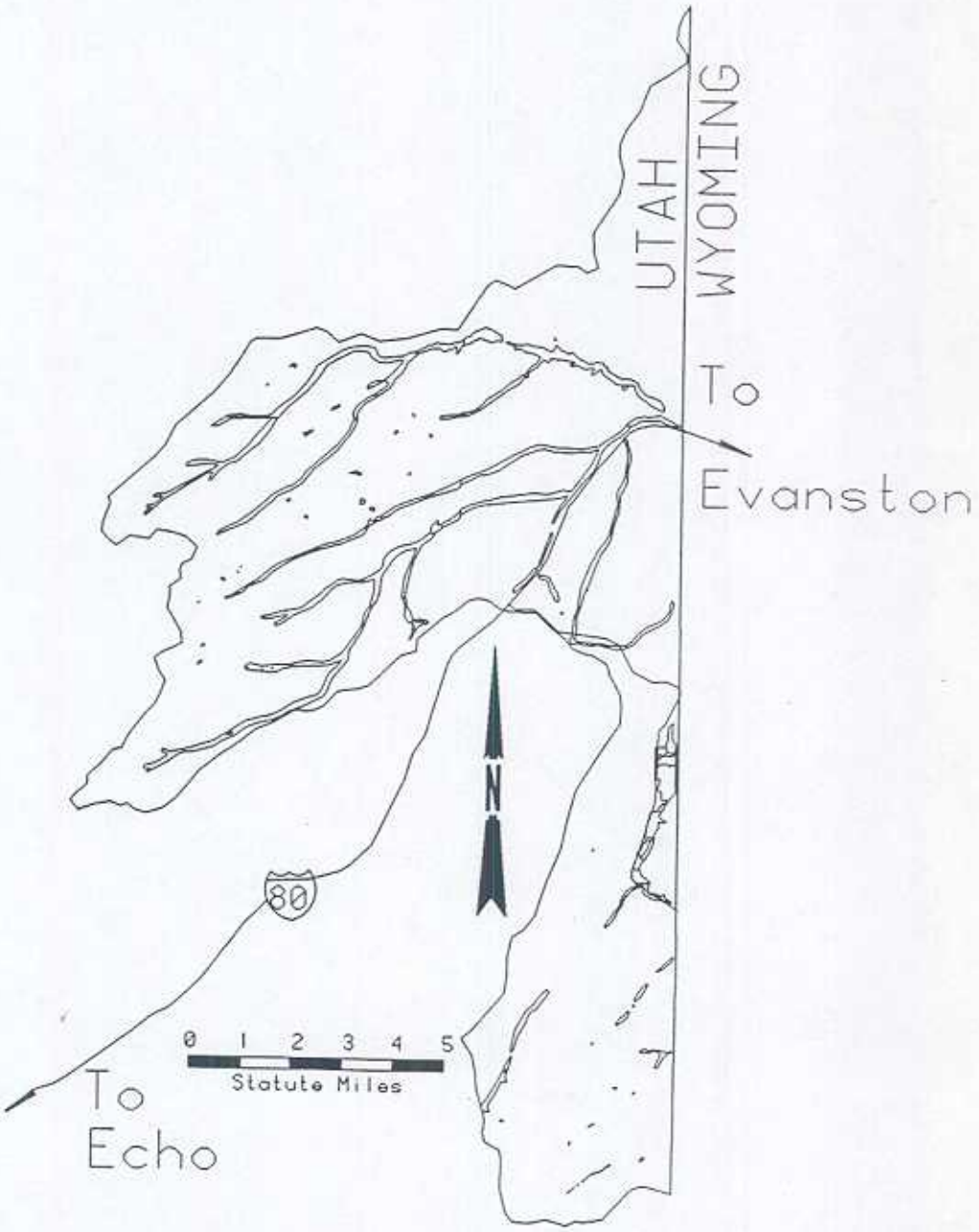



Figure 11. Water-related land use coverage of the Utah portion of the Evanston sub-subarea (2-3-1b).

Land cover area summary for the Utah portion of the Evanston-Uinta sub-subarea (2-3-1c), Figure 12.

| Code | Land Cover | Acres |
|---|---|---|
| IA3d | Pasture | 1,582.3 |
| IIE | Riparian Wetlands | 595.4 |
| IIF | Open Water | 850.9 |
| VB | Residential | 547.1 |
| | | 3,575.7 |

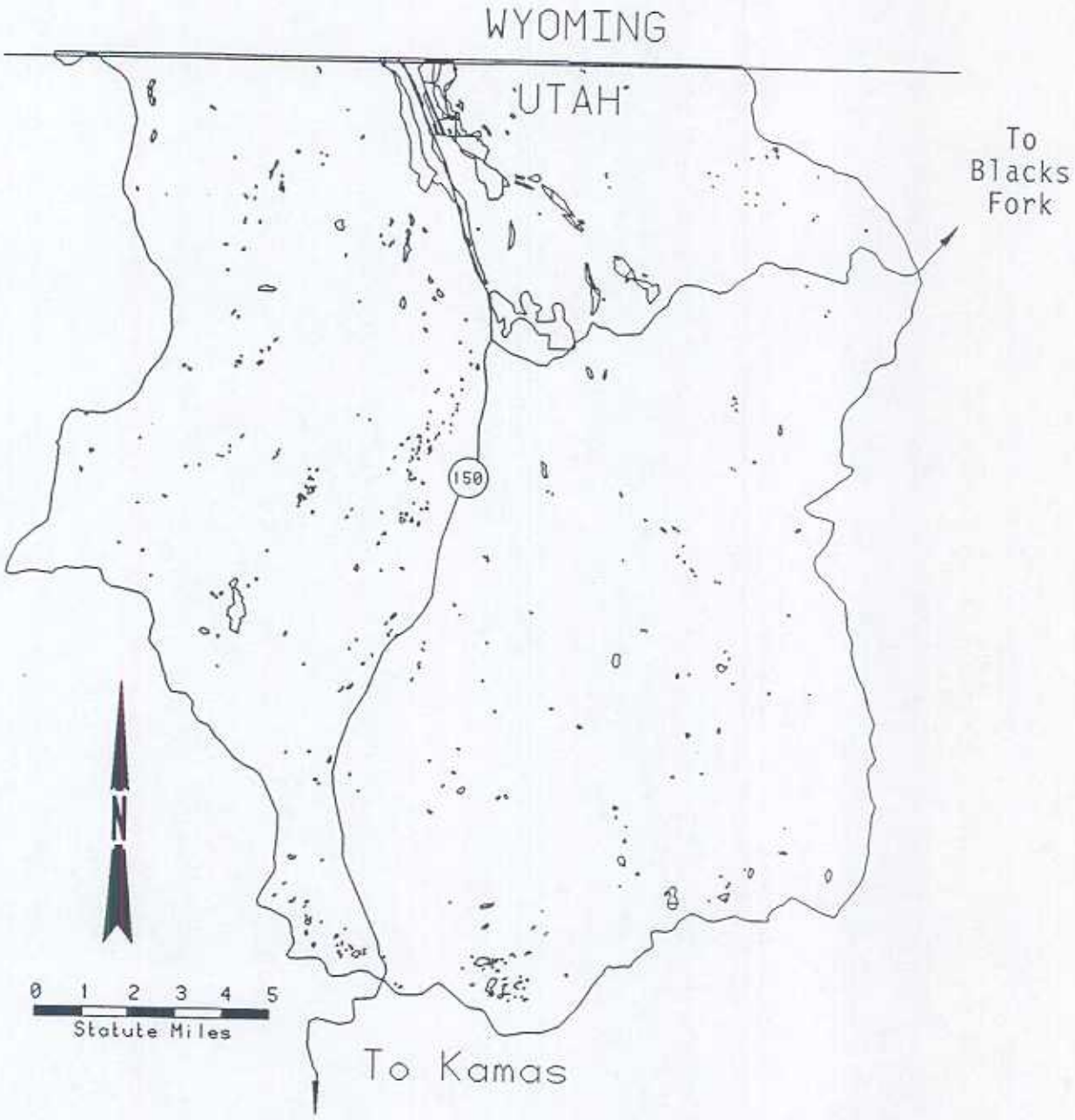



Figure 12. Water-related land use coverage of the Utah portion of the Evanston-Uinta sub-subarea (2-3-1c).

The water-related land use data for the Bear River Basin (Utah portion) has been displayed by subarea (see Figures 5 through 12) and tabulated by subarea and by county. That data follows in Tables 2 and 3, respectively.

As shown in Tables 2 and 3, nearly 569,030 acres of land in Box Elder, Cache, Rich, and Summit counties have been inventoried. This represents about 26 percent of the entire Utah portion of the Bear River Basin (approximately 2,163,000 acres). Areas not inventoried are mainly national forests and rangeland. Of the 569,030 inventoried acres, 277,670 are irrigated cropland, 24,103 are grasses and hays which receive subirrigation, 230,905 are wet/open water areas and 36,350 are residential/industrial areas.

Table 2. Summary of land cover (in acres) by subarea for the Utah portion of the Bear River Basin.

| Code | Cover | Subareas (Utah Portion) 2-1-10a | 2-1-10b & c | 2-2-8 | 2-2-5 | 2-3-3 | 2-3-2 | 2-3-1b | 2-3-1c | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| IA1a | Orchard | 2,151 | 320 | 183 | 97 | 0 | 0 | 0 | 0 | 2,750 |
| IA1e | Berries | 0 | 0 | 20 | 21 | 0 | 0 | 0 | 0 | 41 |
| IA2a | Grain | 4,147 | 31,081 | 34,348 | 549 | 224 | 1,243 | 0 | 0 | 71,591 |
| IA2a1 | Corn | 3,253 | 9,605 | 8,911 | 0 | 0 | 0 | 0 | 0 | 21,769 |
| IA2b1 | Potatoes | 52 | 960 | 3 | 0 | 0 | 0 | 0 | 0 | 1,015 |
| IA2b2 | Onions | 211 | 119 | 5 | 0 | 0 | 0 | 0 | 0 | 336 |
| IA2b3 | Beans | 58 | 627 | 205 | 0 | 0 | 0 | 0 | 0 | 889 |
| IA2b4 | Tomatoes | 19 | 17 | 9 | 0 | 0 | 0 | 0 | 0 | 46 |
| IA2c | Other Row Crops | 18 | 12 | 91 | 0 | 0 | 0 | 0 | 0 | 121 |
| IA3a | Alfalfa | 3,490 | 16,572 | 39,592 | 1,735 | 373 | 7,042 | 0 | 0 | 68,803 |
| IA3b | Grass Hay | 520 | 1,142 | 2,990 | 3,205 | 1,312 | 26,170 | 194 | 0 | 35,534 |
| IA3d | Pasture | 3,360 | 6,610 | 19,145 | 893 | 63 | 2,065 | 3,406 | 1,583 | 37,125 |
| IA3e | Turf | 0 | 461 | 24 | 0 | 0 | 0 | 0 | 0 | 484 |
| IA4a | Idle Plowed | 697 | 7,197 | 4,401 | 54 | 0 | 143 | 0 | 0 | 12,491 |
| IA4b | Idle Overgrown | 736 | 1,028 | 2,923 | 63 | 0 | 60 | 0 | 0 | 4,810 |
| IIA2a2 | Grass Hay (surf. & sub.) | 19 | 319 | 6 | 2,008 | 1,131 | 16,380 | 0 | 0 | 19,863 |
| Surface Irr. Cropland Subtotal | | 18,731 | 76,069 | 112,856 | 8,624 | 3,104 | 53,104 | 3,600 | 1,583 | 277,670 |
| IIA2b1 | Sub. Irr. Pasture | 4,133 | 6,935 | 6,958 | 213 | 533 | 2,310 | 0 | 0 | 21,082 |
| IIA2b2 | Sub. Irr. Grass Hay | 0 | 0 | 0 | 1,002 | 0 | 2,020 | 0 | 0 | 3,021 |
| Sub. Irr. Cropland Subtotal | | 4,133 | 6,935 | 6,958 | 1,215 | 533 | 4,330 | 0 | 0 | 24,103 |
| Total Irrigated Croplands | | 22,863 | 83,004 | 119,814 | 9,839 | 3,636 | 57,434 | 3,600 | 1,583 | 301,772 |
| IIC | Wet Flats | 1,296 | 2,801 | 29 | 0 | 0 | 633 | 10 | 0 | 4,768 |
| IIE | Riparian | 91 | 3,967 | 4,582 | 183 | 22 | 2,446 | 15 | 595 | 11,900 |
| IIF | Open Water | 12,465 | 3,361 | 9,248 | 35,475 | 105 | 1,081 | 316 | 851 | 62,903 |
| IIF4 | Other Water | 127,968 | 0 | 0 | 53 | 0 | 130 | 0 | 0 | 128,152 |
| IIF4a | Temp. Flooded | 6,703 | 10,478 | 5,941 | 0 | 0 | 0 | 0 | 0 | 23,122 |
| IIF4b | Sewage Lagoon | 0 | 0 | 61 | 0 | 0 | 0 | 0 | 0 | 61 |
| Wet/Open Water Areas Subtotal | | 148,522 | 20,607 | 19,861 | 35,711 | 127 | 4,291 | 341 | 1,447 | 230,905 |
| VB | Residential | 4,374 | 4,526 | 16,530 | 4,255 | 26 | 900 | 11 | 547 | 31,170 |
| VB4 | Public Open Space | 23 | 595 | 836 | 177 | 0 | 9 | 0 | 0 | 1,640 |
| VC | Commercial | 696 | 1,061 | 1,648 | 20 | 0 | 115 | 0 | 0 | 3,540 |
| Residential/Industrial Subtotal | | 5,093 | 6,182 | 19,014 | 4,452 | 26 | 1,024 | 11 | 547 | 36,350 |
| Land Use/Land Cover Totals | | 176,478 | 109,792 | 158,688 | 50,002 | 3,789 | 62,749 | 3,952 | 3,577 | 569,027 |

Table 3. Summary of land cover (in acres) by county for the Utah portion of the Bear River Basin.

| Code | Cover | Boxelder | Cache | Rich | Summit | Total |
|---|---|---|---|---|---|---|
| IA1a | Orchard | 2,470 | 183 | 97 | 0 | 2,750 |
| IA1e | Berries | 0 | 20 | 21 | 0 | 41 |
| IA2a | Grain | 35,227 | 34,348 | 2,016 | 0 | 71,591 |
| IA2a1 | Corn | 12,858 | 8,911 | 0 | 0 | 21,769 |
| IA2b1 | Potatoes | 1,013 | 3 | 0 | 0 | 1,015 |
| IA2b2 | Onions | 331 | 5 | 0 | 0 | 336 |
| IA2b3 | Beans | 684 | 205 | 0 | 0 | 889 |
| IA2b4 | Tomatoes | 37 | 9 | 0 | 0 | 46 |
| IA2c | Other Row Crops | 30 | 91 | 0 | 0 | 121 |
| IA3a | Alfalfa | 19,990 | 39,592 | 9,150 | 0 | 68,803 |
| IA3b | Grass Hay | 1,662 | 2,990 | 30,687 | 194 | 35,534 |
| IA3d | Pasture | 9,970 | 19,145 | 5,549 | 2,461 | 37,125 |
| IA3e | Turf | 461 | 24 | 0 | 0 | 484 |
| IA4a | Idle Plowed | 7,894 | 4,401 | 197 | 0 | 12,491 |
| IA4b | Idle Overgrown | 1,764 | 2,923 | 123 | 0 | 4,810 |
| IIA2a2 | Grass Hay (surf. & sub.) | 338 | 6 | 19,519 | 0 | 19,863 |
| Surface Irr. Cropland Subtotal | | 94,728 | 112,856 | 67,359 | 2,655 | 277,670 |
| IIA2b1 | Sub. Irr. Pasture | 11,068 | 6,958 | 3,056 | 0 | 21,082 |
| IIA2b2 | Sub. Irr. Grass Hay | 0 | 0 | 3,021 | 0 | 3,021 |
| Sub Irr. Cropland Subtotal | | 11,068 | 6,958 | 6,078 | 0 | 24,103 |
| Total Irrigated Croplands | | 105,796 | 119,814 | 73,437 | 2,655 | 301,772 |
| IIC | Wet Flats | 4,096 | 29 | 633 | 10 | 4,768 |
| IIE | Riparian | 4,058 | 4,582 | 2,665 | 595 | 11,900 |
| IIF | Open Water | 15,826 | 9,248 | 36,901 | 928 | 62,903 |
| IIF4 | Other Water | 127,968 | 0 | 183 | 0 | 128,152 |
| IIF4a | Temp. Flooded | 17,180 | 5,941 | 0 | 0 | 23,122 |
| IIF4b | Sewage Lagoon | 0 | 61 | 0 | 0 | 61 |
| Wet/Open Water Areas Subtotal | | 169,128 | 19,861 | 40,383 | 1,533 | 230,905 |
| VB | Residential | 8,900 | 16,530 | 5,184 | 555 | 31,170 |
| VB4 | Public Open Space | 618 | 836 | 186 | 0 | 1,640 |
| VC | Commercial | 1,757 | 1,648 | 135 | 0 | 3,540 |
| Residential/Industrial Subtotal | | 11,274 | 19,014 | 5,506 | 555 | 36,350 |
| Land Use/Land Cover Totals | | 286,199 | 158,688 | 119,325 | 4,743 | 569,027 |

## METHODOLOGY FOR GATHERING LAND USE DATA

### Background

The methodology used by the division over the past 20 years in conducting water-related land use studies has varied with regard to procedures use, detail, etc. Earlier inventories were prepared with vertical-aerial photographs and field surveys to label boundaries, vegetation types, and other water use information.

After identifying crops and labeling photographs, the photographs were projected onto a base map and then planimetered or "dot-counted" to determine the acreage. Tables for individual townships and ranges were prepared showing total land within every section and the amount of land in each land use category. Data was then available for use in preparing water budgets.

The water-related land use inventories completed by the division and the U.S. Soil Conservation Service (SCS) over the last 20 years have essentially covered the entire state. The two agencies inventoried about 4 million acres (which included 1.4 million acres of irrigated land) in order to acquire the data needed to prepare hydrologic inventories and to conduct other water-related studies in Utah.

In the early 1980s, the division faced the task of updating its methodology for collecting water-related land use data to take advantage of the rapidly growing fields of remotely sensed data and computerized geographic information systems (GIS). A review of existing data reveals a need to update the information for many hydrologic areas and a further need to develop a procedure for consistent data gathering and updating at 7 to 10 year intervals.

For several years, the division contracted with Dr. Merrill Ridd, University of Utah Research Institute, Center for Remote Sensing and Cartography, to prepare water-related land use inventories. During this period, land use inventories were prepared for the Uinta Basin, Upper and Middle Sevier River, and the Jordan River (Salt Lake County). The inventories used high altitude color infrared photography and laboratory interpretation, with field checking, to collect and tabulate water-related land use data.

Present Method

In March 1984 several division staff members visited the California Department of Water Resources to observe its methodology for collecting water-related land use data for state water planning purposes. The division, based on its review of the California methodology and its own experience, developed a water-related land use inventory program. This program includes the use of 35mm slides, USGS 7-1/2 minute quadrangle maps, field-mapping using base maps produced from the 35mm photography, and a Geographic Information System to process, store, and retrieve land use data.

The first step in an inventory is to identify areas to be covered with aerial photography for any given year. These areas are identified on maps of suitable scale (usually 1:100,000) using previous land use studies and other available information such as maps generated from high altitude color infrared photography or Landsat. Flight lines plotted on the maps show land areas to be covered with aerial photography. Flight lines are generally plotted running north and south through the center sections to be photographed. An exception to the practice is a long narrow canyon with irrigated

land only in the bottom. When this situation is encountered, the flight line will follow the canyon without regard to section lines or compass directions.

During the second step, identified areas are photographed using 35mm slide film. Ideally, the 35mm photography should be conducted at a time of year to show the highest contrast between the water-related land use areas (mainly irrigated land) and surrounding areas. When field mapping/checking is to be scheduled in the same season, the photographs are taken as early in the growing season as possible. The division has generally selected the period from June 15 to July 15.

Aerial photographs are usually obtained by flying an aircraft (Figure 13) carrying a high quality 35mm single lens reflex camera that has been mounted to focus along a vertical axis to the earth. The division specifies a 24mm lens and requires photos to be taken between 6,000 and 6,500 feet above the ground. This procedure allows each slide to cover one square mile with approximately 30 percent overlap on the wide side of the slide and 5 percent on the slide's narrow side. High quality commercial color positive film is used with appropriate commercial processing after each day's flight. The slides are then cataloged according to the flight-line number and shown on a location map. All 35mm slides are stored at the divison offices in files and are cataloged according to individual quadrangle map location.

After cataloging the slides, the division transfers boundaries of water-related areas from the slide to USGS 7-1/2 minute quadrangle maps using a standard slide projector with a 100-200mm zoom lens. The image is directed from the projector, located below a glass table top, to a 45 degree first surface mirror to the back of a quadrangle map. The image showing through

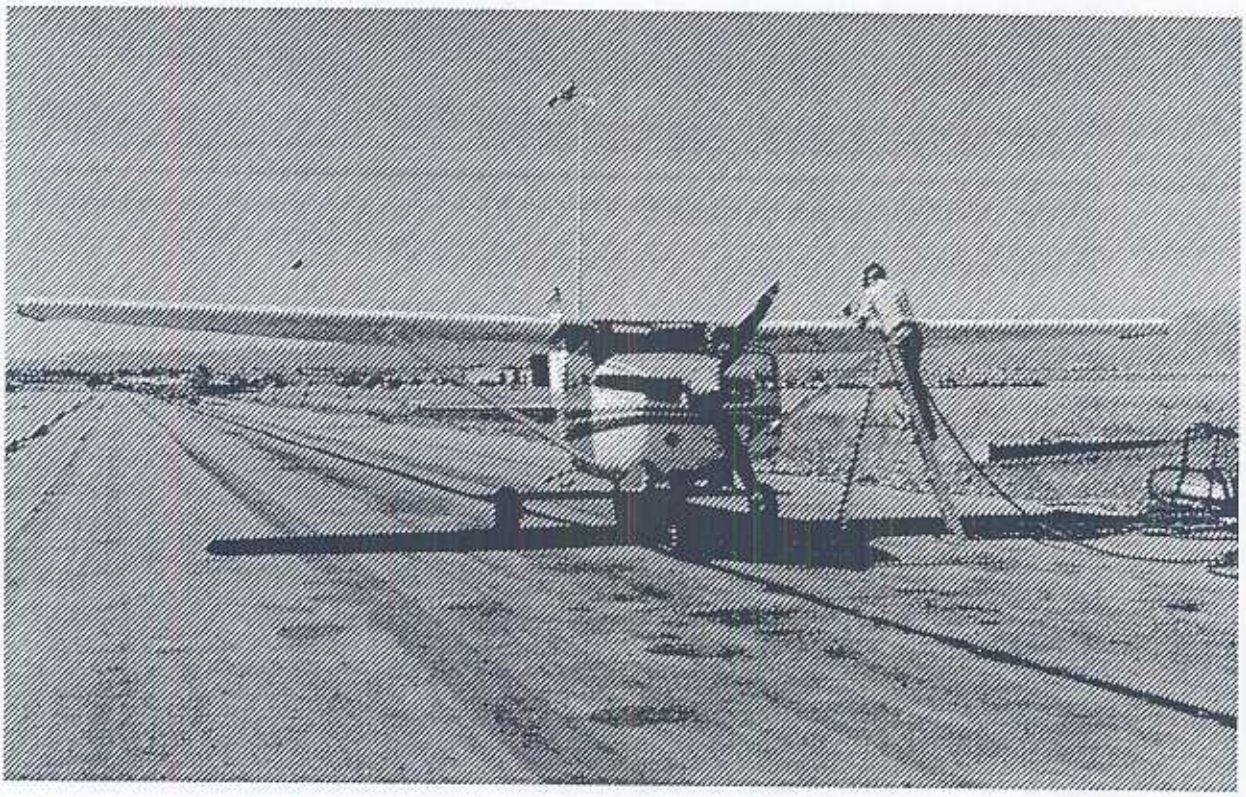


Figure 13. Typical aircraft used for aerial photography.

the map is adjusted to the map scale with the zoom lens. Field boundaries and other water use boundaries are then traced on the 7-1/2 minute quadrangle map. At the same time, a technician attempts to identify the category of land use or land cover and uses a code for the appropriate category in each water use area on the field map. The date that transfer of slide data was completed is also noted on the map. Figure 14 illustrates this basic procedure.

After the slide data is transferred to the quadrangle map, a two-person team uses the map in the field to check the boundaries and land use data on the quadrangle and marks in red the actual land use or land cover category

digitizing work station is shown in Figure 16. All processed data is stored in the State AGRC database. The division uses the special data management and geographic information management capabilities of the AGRC system to produce tabulated water-related land use maps.

Once the land use data has been digitized and processed through the AGRC system, the division plots out a 7-1/2 minute quadrangle line map of the data. These plots are overlaid on the field maps to check for errors in recording or digitizing. An example of a line map (Newton quadrangle) is shown in Figure 17.

Once checked, the data in the AGRC system becomes available for use in water resource planning studies. A map of the Newton quadrangle, similar to what might be obtained from AGRC, is shown in Figure 18.

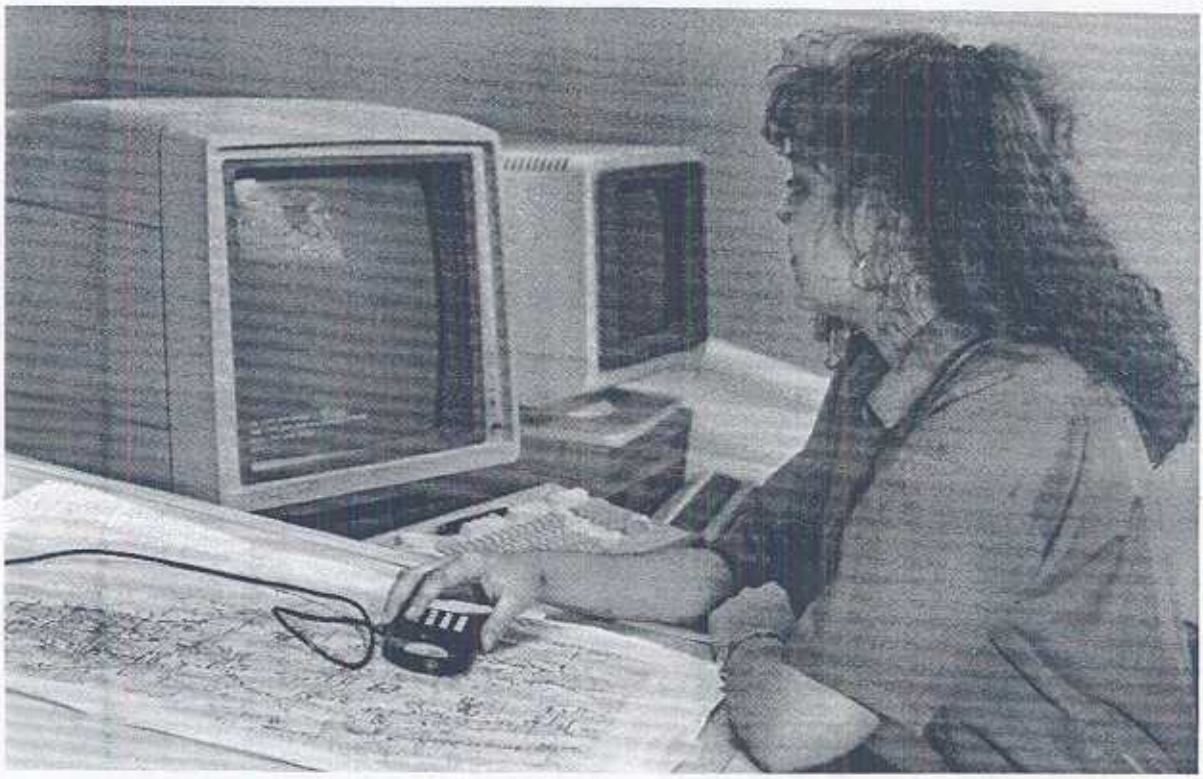


Figure 16. Digitizing work station.

Legend for Computer-Generated Line Maps
In the Bear River Basin:

| Label | Code | Cover Type |
|---|---|---|
| O | IA1a | Orchards |
| BR | IA1e | Berries |
| G | IA2a | Grain |
| C | IA2a1 | Corn |
| V | IA2b | Vegetables |
| PO | IA2b1 | Potatoes |
| ON | IA2b2 | Onions |
| B | IA2b3 | Beans |
| T | IA2b4 | Tomatoes |
| S | IA2c | Other Row Crops |
| A | IA3a | Alfalfa |
| P1 | IA3b | Grass Hay |
| P | IA3d | Pasture |
| TF | IA3e | Turf/Grass Yards |
| F | IA4a | Idle-Plowed |
| I | IA4b | Idle-Overgrown |
| DG | IB1a | Non Irr. Crops |
| DA | IB2a | Non Irr. Alfalfa |
| DP | IB2b | Non Irr. Pasture |
| DF | IB3a | Non Irr. Idle-Plowed |
| DI | IB3b | Non Irr. Idle-Overgrown |
| IWP | IIA2a1 | Irrigated Wet Pasture |
| IWP1 | IIA2a2 | Irrigated Wet Grass Hay |
| WP | IIA2b1 | Wet Pasture/Non Irr. |
| WP1 | IIA2b2 | Non Irr. F.W. Hayland |
| WF | IIC | Wet Flats |
| WR | IIB | Cattail/Bullrush |
| W | IIF | Open Water |
| WM | IIF4a | Temp. Flooded/Marsh |
| SL | IIF4b | Sewage Lagoons |
| EP | IIF4c | Evaporation Pond |
| R | VB1 | Buildings/Homes |
| R2 | VB2 | Buildings/Homes |
| RP | VB3 | Open Spaces |
| R | VB6a | Residential |
| CM | VC1 | Commercial |
| CI | VC2 | Industrial |
| CS | VC3 | Open Spaces |

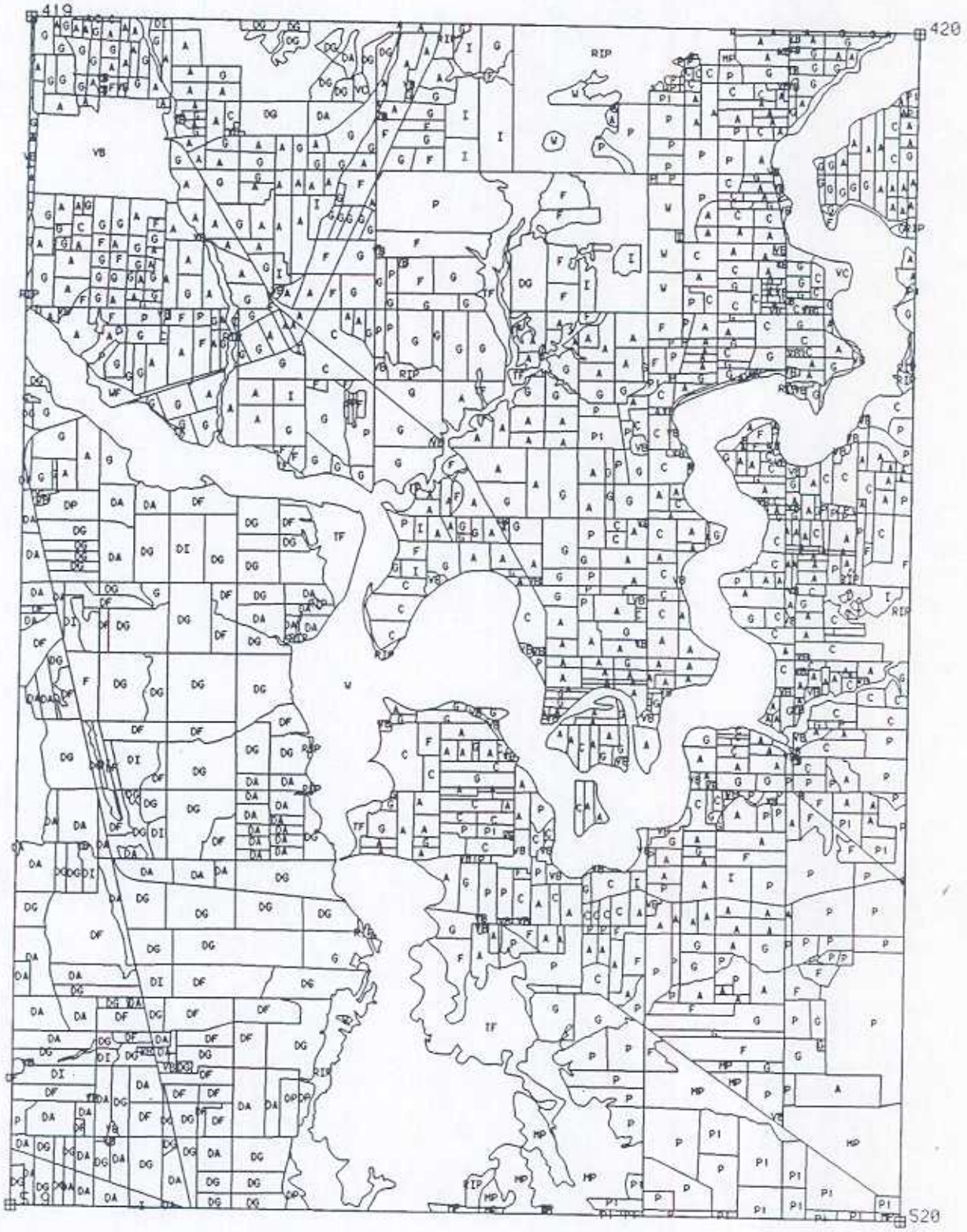
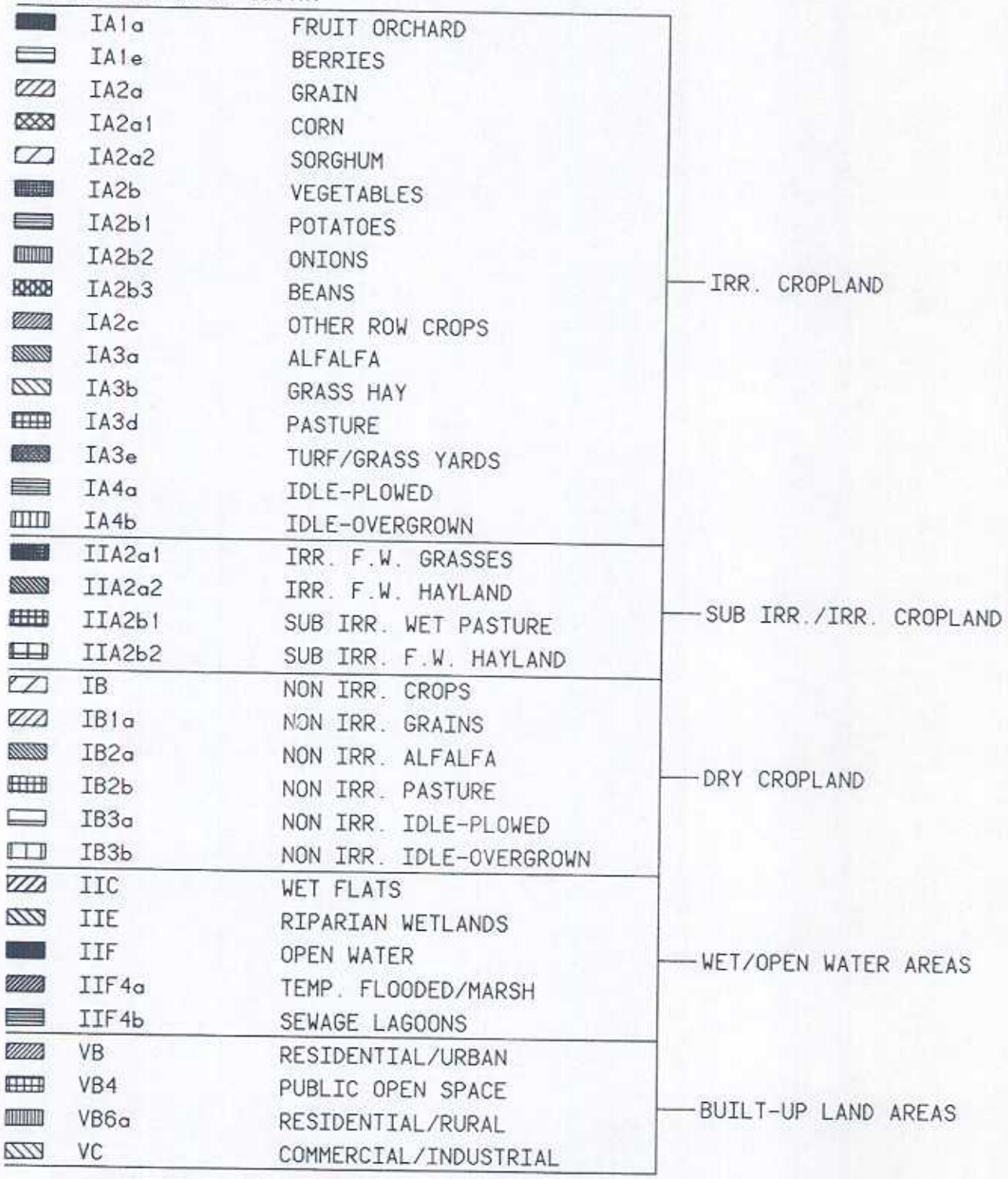



Figure 17. Computer-generated line map of the Newton 7-1/2 minute quadrangle.

Legend for Computer-Generated Maps
in the Bear River Basin.



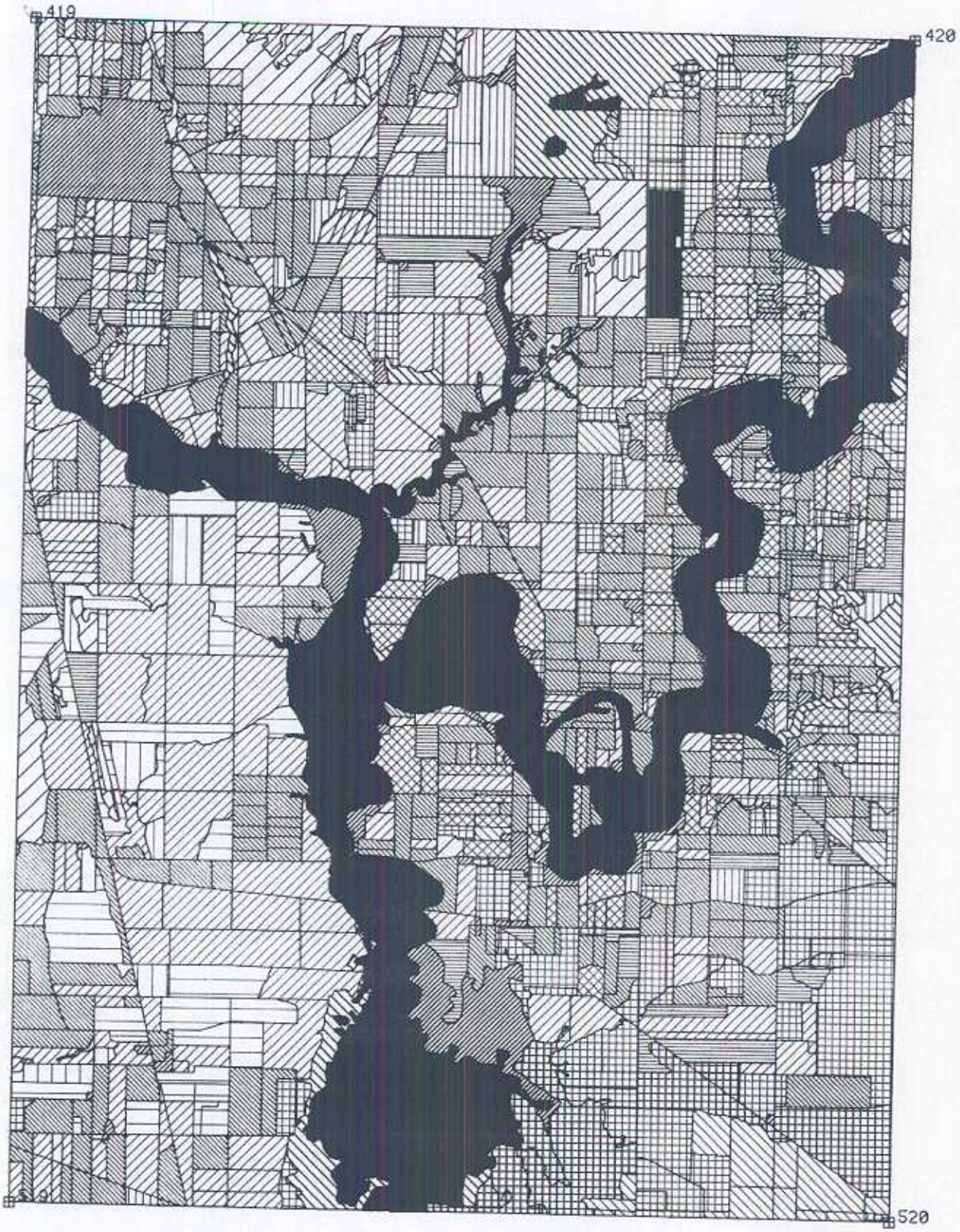



Figure 18. Computer-generated map (Newton quadrangle).

## LAND USE CATEGORIES

During the division's years of collecting water-related land use data, land use categories and map codes have varied from inventory to inventory.

In late 1984 an Active Mappers Committee was formed. A list of the committees is in Appendix B. The committee reviewed all ongoing mapping efforts in the state and then focused on the issue of coordinating and standardizing map data. A summary of the committee's work along with a standard code developed by this committee is in Appendix B. The division is committed to using the "1988 Standard" Cover Types and Codes List developed from this committee.

As each water-related land use inventory for the state is completed, and as some areas are re-inventoried, it becomes useful to tabulate and compare changes in these inventories. Because of the different cover type names and codes that have been used in the past, it becomes necessary to reference earlier codes and land cover types to the 1988 Standard Cover Types and Codes. Table 4 shows the codes from earlier studies that relate to the standard cover types and codes. Data from studies prior to 1988, which has been entered into the AGRC library data base, have been adjusted to the 1988 Standard Code. Some published reports may show the codes used prior to 1988. Appendix C lists the previous land use studies conducted by the division.

Table 4. List of cover types and land use codes (standardized in 1988) for the state of Utah with the state code and comparisons of the 1988 standard code and cover type to previous land use inventories.

| STATE CODE | COVER TYPES (Standardized in 1988) | UTAH LK. (66)[1] BEAR R. (69) WEBER R. (70) | UINTAH (67) W. COLO. (67) VIRGIN R.(78) UINTA B. (80) | S.L.CO. (82) | U. SEVIER (81) M. SEVIER (83) L. SEVIER (85) BEAR R. (86) WEBER R. (87) |
|---|---|---|---|---|---|
| I | Cropland | -[2] | - | - | *[3] |
| IA | Irrigated | A[4] | A | - | * |
| IA1 | Hort. & Specialty Crops | - | - | - | * |
| IA1a | Fruit | A8 | A16 | - | * |
| IA1a1 | Cherry | - | - | - | * |
| IA1a2 | Apple | - | - | - | * |
| IA1a3 | Peach | - | - | - | * |
| IA1a4 | Pear | - | - | - | * |
| IA1a5 | Apricot | - | - | - | * |
| IA1a6 | Other | - | - | - | * |
| IA1b | Nuts | - | - | - | * |
| IA1b1 | Walnut | - | - | - | * |
| IA1b2 | Pecan | - | - | - | * |
| IA1b3 | Other | - | - | - | * |
| IA1c | Vineyard | - | - | - | * |
| IA1d | Bush Fruit | - | - | - | * |
| IA1e | Berries | - | - | - | * |
| IA1f | Nurseries | - | - | - | * |
| IA1g | Other | - | - | - | * |
| IA2 | Row & Close-Grown Crops | - | - | - | * |
| IA2a | Grain | A4 | - | Ag | * |
| IA2a1 | Corn | A5 | A1 | - | * |
| IA2a2 | Sorghum | - | - | - | * |
| IA2a3 | Wheat | - | A9 | - | * |
| IA2a4 | Barley | - | A7 | - | * |
| IA2a5 | Oats | - | A8 | - | * |
| IA2a6 | Other | - | - | - | * |
| IA2b | Vegetables | - | - | - | * |

[1] The data in parentheses (66) identifies the year the field checking was conducted for the various inventories.

[2] The dash (-) indicates that there was no corresponding cover type mapped for the above inventories.

[3] The asterisk (*) indicates that the cover type for the above inventories is the same as the 1988 standard cover types.

[4] The use of a code, such as the (A) footnoted, indicates that the code used for the above inventory corresponds to the 1988 standard cover types.

[5] The codes that appear in this column are those that are different than the 1988 standard code.

Table 4. Continued.

| STATE CODE | COVER TYPES (Standardized in 1988) | UTAH LAKE (66)[1] BEAR R. (69) WEBER R. (70) | UINTAH (67) W. COLO. (67) VIRGIN R.(78) UINTA B. (80) | S.L.CO. (82) | U. SEVIER (81) M. SEVIER (83) L. SEVIER (85) BEAR R. (86) WEBER R. (87) |
|---|---|---|---|---|---|
| IA2b1 | Potatoes | A7 | A3 | – | * |
| IA2b2 | Onions | – | – | – | * |
| IA2b3 | Beans | A13 | – | – | * |
| IA2b4 | Tomatoes | A10 | A5 | – | * |
| IA2b5 | Sweet Corn | – | – | – | * |
| IA2b6 | Other | A6,A9,A11 | A2,A4,A6 | – | IA2b5[5] |
| IA3 | Forage Crops | – | – | A | * |
| IA3a | Alfalfa | A1 | A10 | – | * |
| IA3b | Grass Hay | A3 | A12 | – | * |
| IA3c | Grass/Turf | – | – | – | IA3e |
| IA3d | Pasture | A2 | A13 | – | * |
| IA3e | Other | – | A11 | – | IA3c |
| IA4 | Other | – | A18 | Ai | * |
| IA4a | Fallow Plowed | – | – | – | * |
| IA4b | Idle (Overgrown) | A12 | A17 | – | * |
| IB | Non-Irrigated | E | B | D | * |
| IB1 | Row & Close-Grown Crops | – | – | – | * |
| IB1a | Grain (Beans, Seeds) | E1 | – | – | * |
| IB1a1 | Wheat | – | B2 | – | * |
| IB1a2 | Other Grains | – | B3 | – | * |
| IB1a3 | Dry Beans | – | B4 | – | * |
| IB1a4 | Safflower | – | – | – | * |
| IB2 | Hayland Crops | – | – | – | * |
| IB2a | Alfalfa | E2 | B1 | – | * |
| IB2b | Pasture | E3 | B5 | – | * |
| IB2c | Other | E5 | – | – | * |
| IB3 | Other (Plowed) | – | B7 | – | * |
| IB3a | Fallow | E4 | B6 | Df | * |

[1] The data in parentheses (66) identifies the year the field checking was conducted for the various inventories.

[2] The dash (–) indicates that there was no corresponding cover type mapped for the above inventories.

[3] The asterisk (*) indicates that the cover type for the above inventories is the same as the 1988 standard cover types.

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[5] The codes that appear in this column are those that are different than the 1988 standard code.

Table 4. Continued.

| STATE CODE | COVER TYPES (Standardized in 1988) | UTAH LAKE (66)[1] BEAR R. (69) WEBER R. (70) | UINTAH (67) W. COLO. (67) VIRGIN R.(78) UINTA B. (80) | S.L.CO. (82) | U. SEVIER (81) M. SEVIER (83) L. SEVIER (85) BEAR R. (86) WEBER R. (87) |
|---|---|---|---|---|---|
| II | Wetlands | C | O,F | - | * |
| IIA | Grassy Aspect | - | - | - | * |
| IIA1 | Irrigated | - | - | - | * |
| IIA1a | Pasture | - | A14 | - | IIA1a1,2a1 |
| IIA1b | Hayland | - | A15 | - | IIA1a2,2a2 |
| IIA2 | Non-Irrigated | - | - | - | * |
| IIA2a | Pasture | C4 | 8,F8 | Ws | IIA1b1,2b1 |
| IIA2b | Hayland | - | - | - | IIA1b2,1b2 |
| IIA2c | Non-Agri Use | - | - | - | IIA1b3,2b3 |
| IIB | Cattail/Bullrush | C1 | F4 | Wc | * |
| IIC | Wet Plats (Barren) | - | - | M | * |
| IID | Shrub Aspect | C5 | F2 | - | * |
| IIE | Riparian | C2 | - | Wr | * |
| IIE1 | Forested Aspect | - | F1 | - | * |
| IIE2 | Shrub Aspect | C3 | 3,5,6,7,9 | - | * |
| IIF | Open Water | B | E | - | * |
| IIF1 | Streams | - | - | - | * |
| IIF2 | Reservoirs | - | E1,E2 | - | * |
| IIF3 | Ponds/Lakes | - | E4 | - | * |
| IIF4 | Other | - | E3 | - | * |
| IIF4a | Temp. Flooded | - | - | - | * |
| IIF4b | Sewage Lagoon | - | - | - | * |
| IIF4c | Evaporation Pond | - | - | S | IIFAC,VC2 |
| III | Range & Forest Land | - | - | - | * |
| IIIA | Alpine Plants | - | - | - | * |
| IIIB | Conifer | - | - | Uc | * |
| IIIB1 | Douglas/White Fur | - | - | - | * |

[1] The data in parentheses (66) identifies the year the field checking was conducted for the various inventories.

[2] The dash (-) indicates that there was no corresponding cover type mapped for the above inventories.

[3] The asterisk (*) indicates that the cover type for the above inventories is the same as the 1988 standard cover types.

[4] The use of a code, such as the (A) footnoted, indicates that the code used for the above inventory corresponds to the 1988 standard cover types.

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Table 4. Continued.

| STATE CODE | COVER TYPES (Standardized in 1988) | UTAH LAKE (66)[1] BEAR R. (69) WEBER R. (70) | UINTAH (67) W. COLO. (67) VIRGIN R.(78) UINTA B. (80) | S.L.CO. (82) | U. SEVIER (81) M. SEVIER (83) L. SEVIER (85) BEAR R. (86) WEBER R. (87) |
|---|---|---|---|---|---|
| IIIB2 | Ponderosa | - | - | - | * |
| IIIB3 | Fir/Spruce | - | - | - | * |
| IIIB4 | Lodge Pole Pine | - | - | - | * |
| IIIB5 | Pinyon Juniper | - | - | - | * |
| IIIB6 | Etc. | - | - | - | * |
| IIIC | Deciduous | - | - | Ud | * |
| IIIC1 | Aspen | - | - | - | * |
| IIIC2 | Mountain Brush | - | - | - | * |
| IIIC3 | Etc. | - | - | - | * |
| IIID | Grass Aspect | - | - | - | * |
| IIID1 | Dry Pasture | - | - | - | * |
| IIID2 | Native Grasses | - | - | Ug | * |
| IIID3 | Etc. | - | - | - | * |
| IIIE | Shrub Aspect | - | - | - | * |
| IIIE1 | N. Desert Shrub | - | - | Um | * |
| IIIE1a | Sagebrush | - | - | - | * |
| IIIE1b | Etc. | - | - | - | * |
| IIIE2 | S. Desert Shrub | - | - | - | * |
| IIIE2a | Crosota Bush | - | - | - | * |
| IIIE2b | Etc. | - | - | - | * |
| IIIE3 | Salt Desert Shrub | - | - | - | * |
| IIIE3a | Shadscale | - | - | - | * |
| IIIE3b | Greasewood | - | - | - | * |
| IIIE3c | Saltbrush | - | - | - | * |
| IIIE3d | Desert Molley | - | - | - | * |
| IIIE3e | Etc. | - | - | - | * |
| IV | Barren Lands | - | - | - | * |
| IVA | Bare Soil/Sand | - | - | - | * |
| IVA1 | Dry Salt Flats | - | - | - | * |

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|---|---|---|---|---|---|
| IVA2 | Beaches | - | - | - | * |
| IVA3 | Other Sandy Areas | - | - | - | * |
| IVA4 | Other | - | - | - | * |
| IVB | Rock Outcrop | - | - | Ur | * |
| IVC | Excavated Land | - | - | E | * |
| IVD | Other | - | - | - | * |
| V | Built-Up Land | D | C | - | * |
| VA | Farmstead | - | - | - | * |
| VA1 | Builds/Homes | - | C1,C5 | - | * |
| VA2 | Open Spaces | - | C4 | - | * |
| VB | Residential | - | - | - | * |
| VB1 | High Density | - | C3 | Rt,R | VB1,VB2,VB 6a |
| VB2 | Low Density | - | - | R1 | VB3 |
| VB3 | Open Spaces | - | C2 | L | VB4 |
| VB4 | Idle | - | - | - | * |
| VC | Com/Industrial | F | D | C | * |
| VC1 | Commercial | - | - | - | * |
| VC2 | Industrial | - | - | - | VC4 |
| VC3 | Open Spaces | - | - | X | * |
| VD | Transportation & Utilities | - | - | D | VD,VE |
| VE | Other | - | - | - | * |

[1] The data in parentheses (66) identifies the year the field checking was conducted for the various inventories.

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[3] The asterisk (*) indicates that the cover type for the above inventories is the same as the 1988 standard cover types.

[4] The use of a code, such as the (A) footnoted, indicates that the code used for the above inventory corresponds to the 1988 standard cover types.

[5] The codes that appear in this column are those that are different than the 1988 standard code.

# APPENDIXES

## APPENDIX A

### Hydrologic Inventories

Utah Lake Drainage Area. In cooperation with Utah State University. November 1969. 136 pages - includes substantial climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, geology, economy, history, and physiography.

Uintah Study Unit. In cooperation with Utah State University. March 1970. 181 pages - includes substantial climatic, streamflow, and groundwater data, detailed water budgets, and more general information on topography, geology, arable lands, history, economy, water quality and water development and management. (out of print, file copy only)

Weber River Study Unit. In cooperation with Utah State University. August 1970 - includes substantial climatic, streamflow and groundwater data, detailed water budgets, and more general information on topography, geology, economy, and water quality.

Great Salt Lake Desert Area. In cooperation with Utah State University. November 1971. 70 pages - includes substantial climatic and water resources data, water budget for Tooele Valley, and more general information on physiography, economy, geology, and water management aspects.

Bear River Study Unit. In cooperation with Utah State University. February 1973. 126 pages - includes substantial climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

Price River Study Unit. June 1975. Includes climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

Escalante River Study Unit. December 1976. Includes climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

Dirty Devil River Study Unit. January 1977. Includes climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

San Rafael River Study Unit. January 1977. Includes climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

Update of the Price River Study Unit. June 1978. Includes updated climatic, streamflow, and water use data and detailed water budgets.

Update of the San Rafael River Study Unit. December 1979. Includes updated climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

Virgin and Kanab Study Units (Utah's Lower Colorado River Area). February 1983. Includes climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

Hydrologic Inventory of Colorado, Dolores, and San Juan Study Units. September 1987. Includes climatic, streamflow, and groundwater data, detailed water budgets, and more general information on water quality, topography, geology, and economy.

## APPENDIX B

In late 1984 at the beginning of Division of Water Resource's new phase of mapping water-related land use, an active mappers committee was formed. Water Resources of the Department of Natural Resource and Agriculture Development and Conservation of the Department of Agriculture co-chaired this committee. Lloyd Austin of Water Resources and Jim Christensen of Agriculture filled these roles. Member agencies were:

Automated Geographic Reference
Bureau of Land Management
Bureau of Reclamation
Center of Remote Sensing, University of Utah
Dept of Transportation
Dept of Agriculture
Dept of Natural Resource
Dept of Health - Water Pollution
Div of Water Resources
Div of Water Rights
Div of Wildlife Resource
Soil Conservation Service
State Lands and Forestry
Utah Geological and Mineral Survey
U.S. Fish and Wildlife
U.S. Forest Service/Ogden
U.S. Forest Service
U.S. Geological Service
Utah State University-Extension Service

The committee surveyed all ongoing mapping efforts and then focused on the issue of coordinating and standardizing map data. The relationships between several state agencies and the AGR program of the Office of Planning and Budget were also clarified. Three specific products came from this committee's work. The first was a standardized definition of a base resource data map file as follows:

| Layers of Data | Level of Detail |
|---|---|
| Infrastructure & Base | Map Quad Sheet (USGS Topo) 1:24,000 scale |
| Ownership | Federal/State/Private, input 1:250,000 scale |
| Soils | Level 3 definition with preferred input of 1:24,000 scale |
| Land Cover | Use standard legend and set preferred input 1:24,000 scale |
| Climate | Precipitation/Temperature 1:250,000 input scale |

Secondly, a standard legend for a cover map was developed and agreed upon which allows a hierarchy of data entry. This is shown as Table 5. The headings which are marked with an asterisk were minimum required for the base data set. Individual agencies could use finer breakdowns as needed for their specific programs.

The Division of Water Resources used only certain categories in the Bear River mapping which were considered necessary for water use budgets being prepared. All rangeland and forestland categories were left off while some categories were subdivided further than required by the base data set standards.

The third agreement reached by the committee was the use of a standard set of watershed units for the state. It was agreed that the maps developed by the United States Geological Survey working with National Water Resources Council would serve as the base standard. Individual agencies could then further subdivide these larger units for specific study purposes. This proposal was also presented to the Resource Development Coordinating Committee during the year 1986 and ratified.

Table 5. List of 1988 standard cover types and codes for the state of Utah.

| Code | Cover Type | Comments/Explanations |
|---|---|---|
| I | Cropland | |
| IA | Irrigated Cropland* | (Rotation Crops) |
| IA1 | Horticulture & Specialty Crops* | |
| IA1a | Fruit | (Orchards) |
| IA1a1 | Cherry | |
| IA1a2 | Apple | |
| IA1a3 | Peach | |
| IA1a4 | Pear | |
| IA1a5 | Apricot | |
| IA1a6 | Other | |
| IA1b | Nuts | (Groves) |
| IA1b1 | Walnut | |
| IA1b2 | Pecan | |
| IA1b3 | Other | |
| IA1c | Vineyard | (Grapes) |
| IA1d | Bush Fruit | |
| IA1e | Berries | |
| IA1f | Other Horticulture | (Nurseries) |
| IA1g | Other Specialty Crops | |
| IA2 | Row and Close Grown Crops* | |
| IA2a | Grain | |
| IA2a1 | Corn | |
| IA2a2 | Sorghum | |
| IA2a3 | Wheat | |
| IA2a4 | Barley | |
| IA2a5 | Oats | |
| IA2a6 | Other Grains | |
| IA2b | Vegetables | |
| IA2b1 | Potatoes | |
| IA2b2 | Onions | |
| IA2b3 | Beans | |
| IA2b4 | Tomatoes | |
| IA2b5 | Sweet Corn | |
| IA2b6 | Other | (Melons, Squash, Etc.) |
| IA3 | Forage Crops* | |

*Required for the basic vegetative cover information of the state.

Table 5. Continued.

| Code | Cover Type | Comments/Explanations |
|---|---|---|
| IA3a | Alfalfa | |
| IA3b | Grass Hay | |
| IA3c | Grass/Turf | (Turf Farms) |
| IA3d | Pasture | |
| IA3e | Other | |
| IA4 | Other* | |
| IA4a | Fallow | (Plowed or disked.) |
| IA4b | Idle | (Overgrown more than one season.) |
| IB | Non-Irrigated Cropland* | (Rotation Crops) |
| IB1 | Row and Close-Grown Crops | |
| IB1a | Grain, Beans, Seeds | |
| IB1a1 | Wheat | |
| IB1a2 | Other Grains | (Barley, Etc.) |
| IB1a3 | Dry Beans | |
| IB1a4 | Safflower | |
| IB1a5 | Other | |
| IB2 | Hayland Crops* | |
| IB2a | Alfalfa | |
| IB2b | Pasture | |
| IB2c | Other | |
| IB3 | Other* | |
| IB3a | Fallow | (Plowed, Stubble, Mulch) |
| IB3b | Idle | (Overgrown more than one season.) |
| II | Grassy/Phreato./Open Water Areas | |
| IIA | Grassy Aspect* | |
| IIA1 | Irrigated* | |
| IIA1a | Pasture | (Subject to spring flooding.) |
| IIA1b | Hayland | (Subject to spring flooding.) |
| IIA2 | Non-Irrigated* | |
| IIA2a | Pasture | (Receives subsurface water.) |
| IIA2b | Hayland | (Receives subsurface water.) |
| IIA2c | Non-Agricultural Use | (Receives subsurface water.) |
| IIB | Cattail/Bullrush Aspect* | |
| IIC | Wet Flats* | (Mud flats w/little or no vgttn.) |

*Required for the basic vegetative cover information of the state.

Table 5. Continued.

| Code | Cover Type | Comments/Explanations |
|---|---|---|
| IID | Shrub Aspect* | (Salt Brush, Sagebrush) |
| IIE | Riparian* | |
| IIE1 | Forested Aspect | (Cottonwoods, Birch) |
| IIE2 | Shrub Aspect | (Willows) |
| IIF | Open Water* | |
| IIF1 | Streams* | |
| IIF2 | Reservoirs* | (Man-Made) |
| IIF3 | Ponds & Lakes* | |
| IIF4 | Other* | |
| IIF4a | Temporary Flooded | |
| IIF4b | Sewage Lagoon | |
| IIF4c | Evaporation Pond | |
| III | Rangeland and Forestland | |
| IIIA | Alpine Plant Communities* | |
| IIIB | Conifer* | |
| IIIB1 | Douglas Fir - White Fir | |
| IIIB2 | Ponderosa Pine | |
| IIIB3 | Fir - Spruce | |
| IIIB4 | Lodgepole Pine | |
| IIIB5 | Pinion Pine - Juniper | |
| IIIB6 | Other | |
| IIIC | Deciduous* | |
| IIIC1 | Aspen | |
| IIIC2 | Mountain Brush | (Oak Brush, Maples, Chaparral) |
| IIIC3 | Other | |
| IIID | Grass Aspect* | |
| IIID1 | Dry Pastures - Improved | (Chained & reseeded.) |
| IIID2 | Native Grasses | |
| IIID3 | Other | (Forbs) |
| IIIE | Shrub Aspect* | |
| IIIE1 | Northern Desert Shrubs* | |
| IIIE1a | Sagebrush | |
| IIIE1b | Other | (Shadscale, Greasewood, Halogeton) |

*Required for the basic vegetative cover information of the state.

Table 5. Continued.

| Code | Cover Type | Comments/Explanations |
|---|---|---|
| IIIE2 | Southern Desert Shrubs* | |
| IIIE2a | Creosote Bush | |
| IIIE2b | Other | (Forbs, Annual Grasses) |
| IIIE3 | Salt Desert Shrubs* | |
| IIIE3a | Shadscale | |
| IIIE3b | Greasewood | |
| IIIE3c | Saltbrush | |
| IIIE3d | Desert Molley | |
| IIIE3e | Other | (Halogeton) |
| IV | Barren Lands | |
| IVA | Bare Soil/Sand* | |
| IVA1 | Dry Salt Flats | |
| IVA2 | Beaches | |
| IVA3 | Sandy Areas Other Than Beaches | (Desert Sand Dunes) |
| IVA4 | Other | |
| IVB | Rock Outcrops* | |
| IVC | Excavated Lands* | (Strip Mines, Quarries, Gravel Pits) |
| IVD | Other* | |
| V | Built-Up Land* | |
| VA | Farmsteads* | |
| VA1 | Buildings/Homes | |
| VA2 | Open Spaces | (Feed Lots, Etc.) |
| VB | Residential* | |
| VB1 | Buildings/Homes | (High density) |
| VB2 | Buildings/Homes | (Low density) |
| VB3 | Open Spaces | (Parks, Golf Courses) |
| VB4 | Idle Spaces | (Not irrigated) |
| VC | Commercial/Industrial* | |
| VC1 | Commercial | |
| VC2 | Industrial | |
| VC3 | Open Spaces | |
| VD | Transportation, Communications, Utilities* | |
| VE | Other* | |

*Required for the basic vegetative cover information of the state.

## APPENDIX C

Water-Related Land Use Studies

Utah Lake Drainage Area. In cooperation with Utah State University. February 1968 - detailed water-related land use tables and maps.

Bear River Drainage Area. In cooperation with Utah State University. April 1969 - detailed water-related land use tables and maps.

Weber River Drainage Area. In cooperation with Utah State University. February 1970 - detailed water-related land use tables and maps.

Uinta Hydrologic Area. Staff Report No. 7. September 1971 - detailed water-related land use tables and maps.

West Colorado Hydrologic Area. Staff Report No. 8. January 1972 - detailed water-related land use tables and maps.

Uinta Basin. In cooperation with U.S. Soil Conservation Services and National Aeronautics and Space Administration. 1980. Contains detailed water-related land use maps and tables. Investigates the use of landsat data concurrently with the high altitude color infrared photography to update the changing patterns of land use. Performed under contract with the Center for Remote Sensing and Cartography of the University of Utah Research Institute. 109 pages plus maps.

Sevier River Basin (Upper Portion), 1981. Contains detailed water-related land use maps and tables. Performed under contract with the Center for Remote Sensing and Cartography of the University of Utah Research Institute. 27 pages plus maps.

Sevier River Basin (Lower Portion), 1985. Contains detailed water-related land use maps and tables.

Salt Lake County, 1982. Contains detailed water-related land use maps and tables. Performed under contract with the Center for Remote Sensing and Cartography of the University of Utah Research Institute. 24 pages plus maps.

Sevier River Basin (Middle Portion), 1984. Contains detailed water-related land use maps and tables. Performed under contract with the Center for Remote Sensing and Cartography of the University of Utah Research Institute. 34 pages plus maps.

Virgin River Area, 1990. Contains detailed water-related land use maps and tables. Performed in cooperation with USDA Soil Conservation Service, St. George, Utah office and Utah Division of Water Rights, Cedar City Area Office. 56 pages plus maps.